Contents

UNIT

1

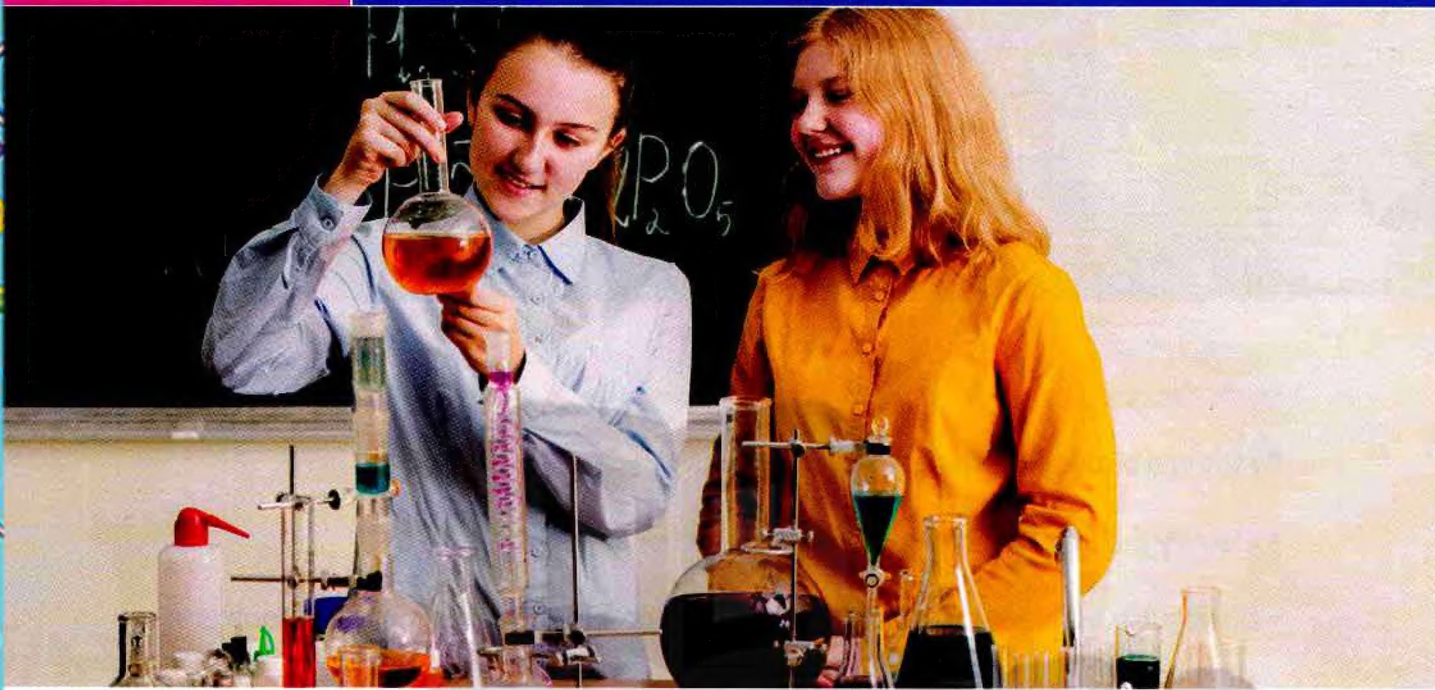
Chemical Reactions

Unit Objectives :

By the end of this unit, students will be able to :

- Identify the different types of chemical reactions.
- Distinguish between the reactions of thermal decomposition, simple and double substitution.
- Identify the concepts of oxidation, reduction, oxidizing and reducing agents.
- Identify the concept of the speed of chemical reaction.
- Identify the factors affecting the speed of chemical reaction.
- Deduce the effect of the nature of reactants, concentration, temperature and catalysts on the speed of chemical reaction.
- Evaluate the importance of chemical reactions in our life.

LESSON 1 Chemical Reactions

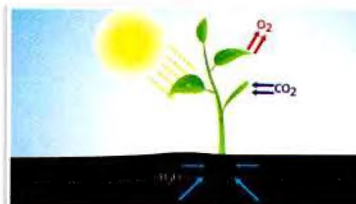


What are the types of chemical reactions and their importance ?

Chemical reactions play an important role in our daily life as in the following examples :

1. Burning of a car fuel (gasoline) in the car engine generates power, which makes the car move.

2. Plants make their own food through photosynthesis process, which depends mainly on the reaction of carbon dioxide with water.



3. Medicines, fertilizers and artificial fibers are examples of products of some chemical reactions.

Chemical reaction

It is the breaking up of bonds in the reactants molecules and formation of new bonds in the products (resultants) molecules from the reaction.

Types of chemical reactions

First Thermal decomposition reactions.

1. Decomposition of some metal oxides.
2. Decomposition of some metal hydroxides.
3. Decomposition of most metal carbonates.
4. Decomposition of most metal sulphates.
5. Decomposition of some metal nitrates.

Second Substitution reactions.

1. Simple substitution reactions.
   - a. A metal substitutes the hydrogen of water.
   - b. A metal substitutes the hydrogen of diluted acid.
   - c. A metal substitutes another metal in its salt solution.
2. Double substitution reactions.
   - a. Between an acid and an alkli.
   - b. Between an acid and a salt.
   - c. Between two salt solutions.

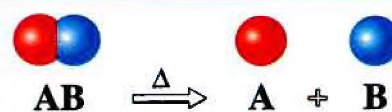
Third Oxidation and reduction reactions.

1. According to traditional concept.
2. According to modern (electronic) concept.

FIRST Thermal decomposition reactions

Thermal decomposition reactions

They are chemical reactions which involve the breaking up of the compounds with the effect of heat into its primary elements or simpler compounds than the original ones.

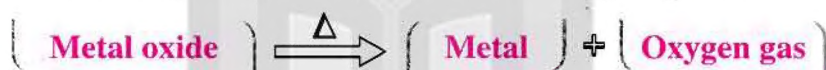


Representation of thermal decomposition reactions

* **The products of thermal decomposition reactions differ according to the difference of the type of the compound used in the reaction as follows :**

1 Thermal decomposition of some metal oxides

* Some metal oxides decompose by heat into **metal** and **oxygen gas** evolves.



Activity (1) Thermal decomposition of red mercuric oxide (HgO) :

Procedures:

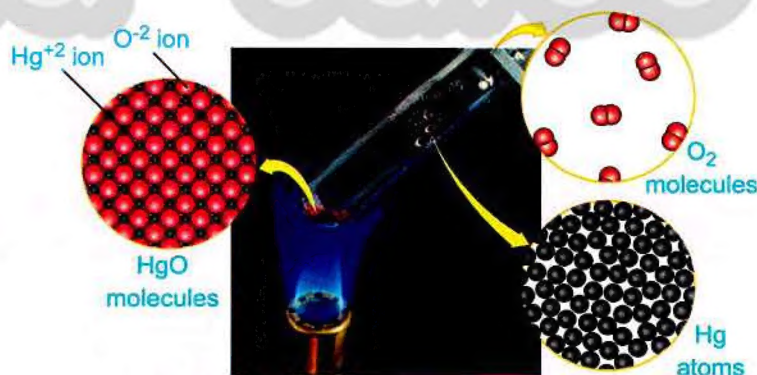
1. Put a little amount of red mercuric oxide in a clean test tube.
2. Heat the content of the test tube by using a flame.
3. Approach a burning match close to the opening of the tube.

Observations:

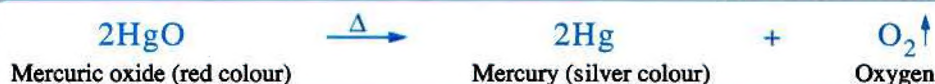
1. A silvery precipitate is formed at the bottom of the tube.
2. The burning match glows more.

Conclusion:

Red mercuric oxide decomposes by heat into mercury (silvery precipitate) at the bottom of the tube, and oxygen gas evolves (which increases the glow of a burning match).



Decomposition of mercuric oxide


$$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$$
Mercuric oxide (red colour) — Mercury (silver colour) — Oxygen

2 Thermal decomposition of some metal hydroxides

* Some metal hydroxides decompose by heat into **metal oxide** and **water vapour** evolves.

Activity 2 Thermal decomposition of blue copper hydroxide [$Cu(OH)_2$] :

Procedures:

1. Put a little amount of blue copper hydroxide in a clean test tube.
2. Heat the content of the test tube by using a flame.

Observation:

A black substance is formed.

Conclusion:

Blue copper hydroxide decomposes by heat into copper oxide (black colour) and water vapour evolves.

3 Thermal decomposition of most metal carbonates

* Most metal carbonates decompose by heat into **metal oxide** and **carbon dioxide gas** evolves.

Activity 3 Thermal decomposition of green copper carbonate ($CuCO_3$) :

Procedures:

1. Put a little amount of green copper carbonate in a clean test tube.
2. Heat the content of the test tube by using a flame.
3. Pass the produced gas into a clear limewater for a short time.

Observations:

1. A black substance is formed.
2. The clear limewater becomes turbid.

Conclusion:

Green copper carbonate decomposes by heat into copper oxide (black colour) and carbon dioxide gas evolves (which turbids clear limewater).

$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

Copper carbonate (green colour) → Copper oxide (black colour) + Carbon dioxide

Decomposition of copper carbonate

4 Thermal decomposition of most metal sulphates

* Most metal sulphates decompose by heat into **metal oxide** and **sulphur trioxide gas** evolves.

Metal sulphate $\xrightarrow{\Delta}$ Metal oxide + Sulphur trioxide gas

Activity 4 Thermal decomposition of blue copper sulphate ($CuSO_4$) :

Procedures:

1. Put a little amount of blue copper sulphate in a clean test tube.
2. Heat the content of the test tube by using a flame.

Observation:

A black substance is formed.

Conclusion:

Blue copper sulphate decomposes by heat into copper oxide (black colour) and sulphur trioxide gas evolves.

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

Copper sulphate (blue colour) → Copper oxide (black colour) + Sulphur trioxide

5 Thermal decomposition of some metal nitrates

* Some metal nitrates decompose by heat into **metal nitrite** and **oxygen gas** evolves.

Metal nitrate $\xrightarrow{\Delta}$ Metal nitrite + Oxygen gas

Activity 5 Thermal decomposition of white sodium nitrate ($NaNO_3$) :

Procedures:

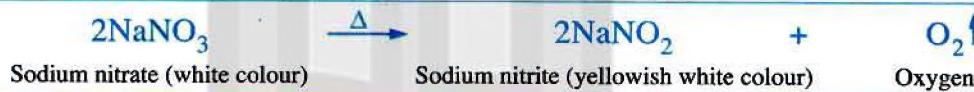
1. Put a little amount of white sodium nitrate in a clean test tube.
2. Heat the content of the test tube by using a flame.
3. Approach a burning match close to the opening of the tube.

Observations:

1. A yellowish white substance is formed.
2. The burning match glows more.

Conclusion:

White sodium nitrate decomposes by heat into sodium nitrite (yellowish white colour) and oxygen gas evolves (which increases the glow of the burning match).



$$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$$

Sodium nitrate (white colour) → Sodium nitrite (yellowish white colour) + Oxygen

Question 1

Complete the following table :

Reactant		Products	Examples
Metal oxide	heat	Metal + Oxygen gas	.... $\xrightarrow{\Delta}$ .... + $O_2\uparrow$ Mercuric oxide (.......... colour) → Mercury (silver colour)
Metal hydroxide	heat	Metal oxide + ...	$Cu(OH)_2$ $\xrightarrow{\Delta}$ .... + $H_2O\uparrow$ .... (blue colour) → Copper oxide (.......... colour)
Metal	heat	Metal oxide + Carbon dioxide gas	.... $\xrightarrow{\Delta}$ .... + ...↑ Copper carbonate (.......... colour) → .... (black colour) + ...
Metal sulphate	heat	Metal oxide + ...	.... $\xrightarrow{\Delta}$ CuO + $SO_3\uparrow$ .... (.......... colour) → Copper oxide (black colour) + ...
Metal nitrate	heat	.... + Oxygen gas	.... $\xrightarrow{\Delta}$ $2NaNO_2$ + ...↑ .... (.......... colour) → .... (.......... colour) + ...

Science, Technology and Society

Air bags

Air bag :

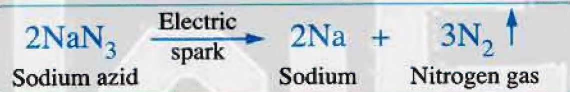
It is an inflatable bag folded inside the steering wheel in modern cars.

Importance :

They are considered one of the most important safety means in cars at emergencies.

The idea of operation :

- On the occurrence of a car accident (crash) or a sudden drop in the speed of the car, an electric spark is generated works on decomposition and explosion of the substance of sodium azid (which is present inside the air bag) forming sodium and nitrogen gas evolves.



$$2NaN_3 \xrightarrow[\text{spark}]{\text{Electric}} 2Na + 3N_2 \uparrow$$

Sodium azid — Sodium — Nitrogen gas

- The bag gets inflated by nitrogen gas at an extreme speed (within only 40 milli second), then it gets vacuumed rapidly to ensure clear vision and proper movement for the driver.

SECOND Substitution reactions

- Substitution reactions occur when there is an active element replaces (substitutes) another less active element in another compound.

- Metals arranged according to the degree of their chemical activity in a series, which is known as "chemical activity series".

Chemical activity series (C.A.S.)

It is the arrangement of metals in a descending order according to the degree of their chemical activity.

Element	Symbol
Potassium	K
Sodium	Na
Barium	Ba
Calcium	Ca
Magnesium	Mg
Aluminium	Al
Zinc	Zn
Iron	Fe
Tin	Sn
lead	Pb
Hydrogen	H
Copper	Cu
Mercury	Hg
Silver	Ag
Platinum	Pt
Gold	Au

The degree of chemical activity decreases $\downarrow$

"Chemical activity series"

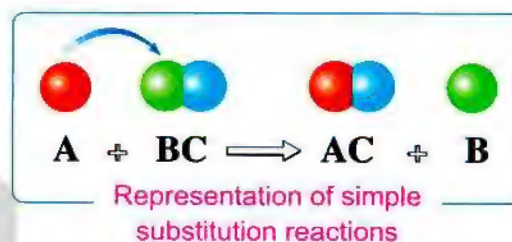
Substitution reactions are classified into two types

1. Simple substitution reactions.
2. Double substitution reactions.

1 Simple substitution reactions

Simple substitution reactions

They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.



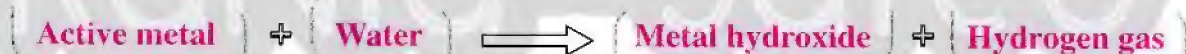
Representation of simple substitution reactions

Types of simple substitution reactions

- (A) A metal substitutes the hydrogen of water.
- (B) A metal substitutes the hydrogen of diluted acid.
- (C) A metal substitutes another metal in its salt solution.

A A metal substitutes the hydrogen of water

- Metals which precede hydrogen in C.A.S. substitute hydrogen of water forming **metal hydroxide** and **hydrogen gas** evolves.



Activity 6 Substitution of sodium to hydrogen of water :

Procedures:

1. Put a small piece of sodium by using tongs in a glass of water.
2. Touch the glass of water carefully after ending the reaction.

Observations:

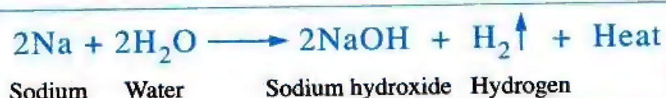
1. Sodium burns with a pop sound (explosion).
2. The glass of water becomes warm.

Warning

Be careful when performing this reaction as this will lead to explosion and also burning. So, you must use a small piece of sodium (which is preserved under the surface of kerosene).

Conclusion:

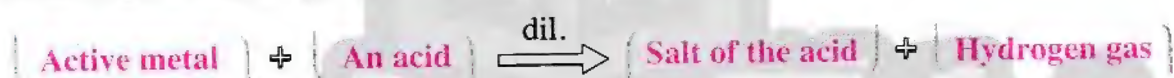
Sodium substitutes the hydrogen of water giving sodium hydroxide and hydrogen gas evolves which burns with a pop sound and the reaction is accompanied by releasing of heat.


$$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + Heat$$
Sodium Water Sodium hydroxide Hydrogen

Reaction of sodium with water

B A metal substitutes the hydrogen of diluted acid

- Metals which precede hydrogen in C.A.S. substitute hydrogen of diluted acid forming **salt of the acid** and **hydrogen gas** evolves.

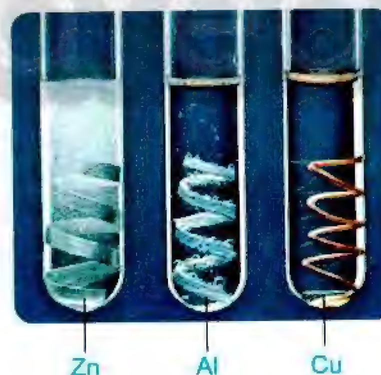


- Metals that come after hydrogen in the chemical activity series cannot substitute hydrogen of diluted acid (except under certain conditions).

Activity 7 Substitution of some metals to hydrogen of diluted acid :

Procedures:

1. Put equal amounts of dil. hydrochloric acid in three test tubes.
2. Add 3 sheets of equal sizes as follows :
   - A sheet of zinc in the first tube.
   - A sheet of aluminium in the second tube.
   - A sheet of copper in the third tube.



Observations:

* Gas bubbles evolve :
  - immediately on adding the sheet of zinc.
  - after a short time on adding the sheet of aluminium.
* No gas bubbles evolve on adding the sheet of copper.

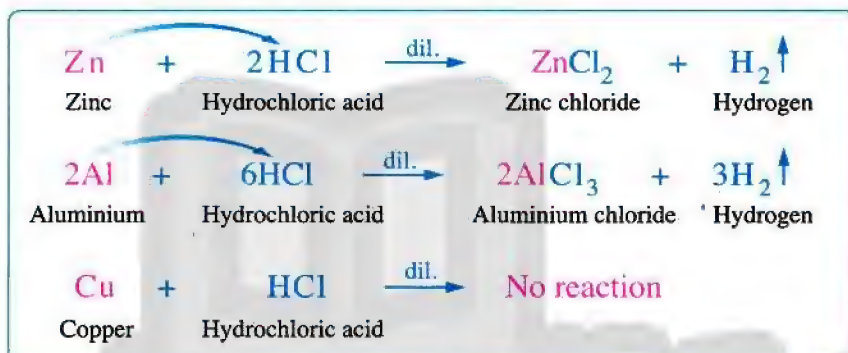
Conclusion:

- Zinc and aluminium replace the hydrogen of diluted acid forming salt of the acid and hydrogen gas evolves **G.R.**

  Because zinc and aluminium precede hydrogen in C.A.S.

- Copper doesn't replace the hydrogen of diluted acid **G.R.**

  Because copper comes after hydrogen in C.A.S.



$$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$$
Zinc + Hydrochloric acid → Zinc chloride + Hydrogen

$$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$$
Aluminium + Hydrochloric acid → Aluminium chloride + Hydrogen

$$Cu + HCl \xrightarrow{dil.} \text{No reaction}$$
Copper + Hydrochloric acid

How can you ...?

- **Detect the evolving of hydrogen gas as a result of substitution of metals to the hydrogen of diluted acids.**

  ➲ By approaching a burning match to it, so it burns with a pop sound.

G.R.

- ***Although aluminium comes before zinc in C.A.S., aluminium delays after zinc in the reaction with diluted hydrochloric acid.***

  Due to the presence of a layer of aluminium oxide (Al_2O_3) on aluminium surface, which takes time to separate from aluminium, that delays the starting of occurrence of the reaction.

- ***Sodium reacts with dil. HCl, while copper does not react with the same acid.***

  Because sodium can replace the hydrogen of diluted acid as it comes before hydrogen in the chemical activity series, while copper comes after the hydrogen.

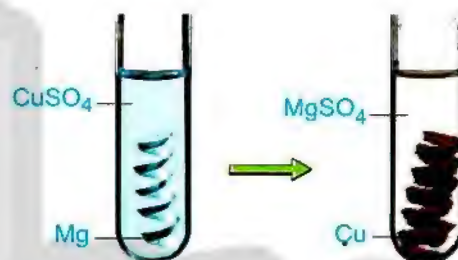
C A metal substitutes another metal in its salt solution

Some metals replace another metals (in their salt solutions) that follow them in the chemical activity series.

Activity 8 Substitution of magnesium to copper in copper sulphate solution :

Procedures:

Put a magnesium sheet in a test tube containing blue copper sulphate solution.

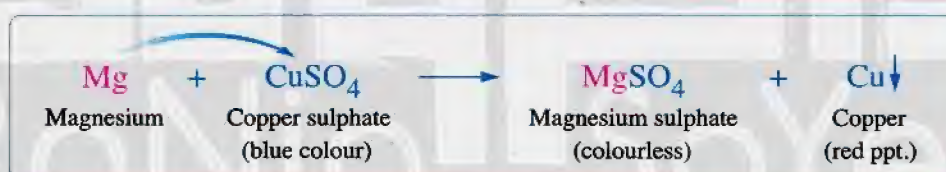


Observation:

The blue colour of copper sulphate disappears and a red precipitate is formed.

Conclusion:

Magnesium is more active than copper (as it comes before copper in the chemical activity series) so, it substitutes copper in copper sulphate solution forming magnesium sulphate (colourless) and copper precipitates (red ppt.)



G.R.

- ***Magnesium can replace copper in its salt solutions, while the opposite doesn't occur.***

Because magnesium precedes copper in C.A.S., so it replaces copper, but copper follows magnesium, so it cannot replace magnesium.

- ***Don't keep silver nitrate solution in aluminium containers.***

Because aluminium precedes silver in C.A.S., so it replaces silver in silver nitrate solution which leads to eroding of aluminium containers.

Note

As the distance between metals increases in C.A.S., as the substitution becomes faster.

Application

Potassium (K) reacts instantly with water, while magnesium (Mg) reacts very slowly with cold water **G.R.**

Because the distance between K & H is greater than the distance between Mg & H in C.A.S (K is more active than Mg).

Reaction of potassium with water

Reaction of magnesium with water

Question 2

Answer the following :

In the light of understanding the simple substitution reactions :

(1) Write the symbols of the following elements according to their arrangement in the C.A.S.

K	Sn	Zn	Mg
Al	Fe	Ba	Pb
Ca	Au	Cu	Na

....
....
....
....
....
....
....
....
....
....
H
....
....

(2) Put (✓) or (✗) :

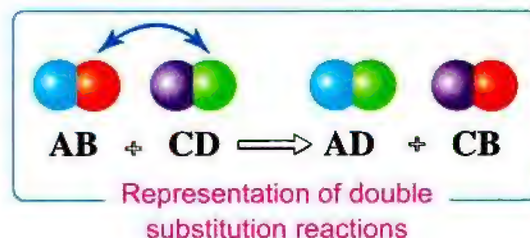
1. Zinc replaces copper in its salt solutions. ( )
2. Gold replaces lead in its salt solutions. ( )
3. Aluminium replaces hydrogen in diluted hydrochloric acid. ( )
4. Magnesium replaces hydrogen of water. ( )

TRY to answer worksheet 1 in the Notebook

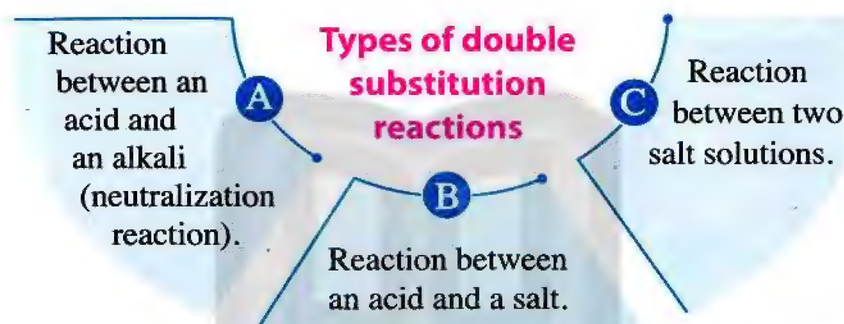
2 Double substitution reactions

Double substitution reactions

They are chemical reactions in which double substitution (exchange) occurs between the ions (radicals) of two different compounds to give two other new compounds.



Representation of double substitution reactions



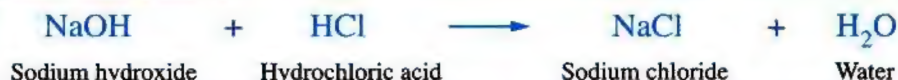
A Reaction between an acid and an alkali [Neutralization reaction]

Neutralization reaction

It is a reaction between an acid and an alkali to form salt and water.

Example

Reaction between hydrochloric acid and sodium hydroxide to form sodium chloride (salt) and water.



Note

On heating the products (resultants) of the previous reaction, H_2O evaporates and NaCl (table salt) remains.

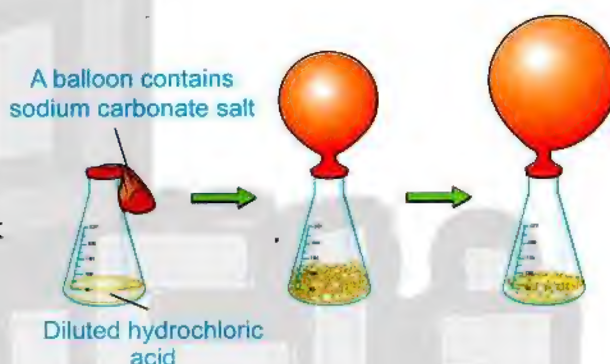
B Reaction between an acid and a salt

Acids react with salts and the resultant depends on the type of both the acid and salt.

Activity 9 Reaction between diluted hydrochloric acid and sodium carbonate :

Procedures:

1. Put an amount of diluted hydrochloric acid in a flask.
2. Put a little amount of sodium carbonate salt in a balloon.
3. Insert the top of the balloon over the edge of the flask.
4. Slowly turn over the balloon in a way that makes the amount of sodium carbonate fall into the flask.



Observation:

- An effervescence happens inside the flask which makes the balloon is blown.

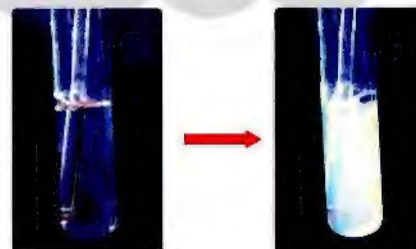
5. Carefully close the balloon and take it away of the flask.
6. Pass the gas formed inside the balloon into a clear limewater in a test tube for a short time.

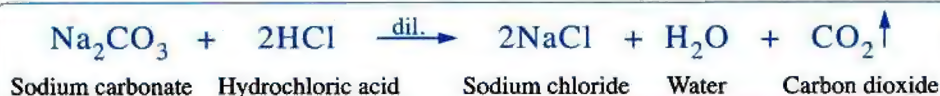
Observation:

The clear limewater becomes turbid.

Conclusion:

Diluted hydrochloric acid reacts with sodium carbonate salt forming sodium chloride, water and carbon dioxide gas evolves which turbids the clear limewater.





$$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$$

Sodium carbonate + Hydrochloric acid → Sodium chloride + Water + Carbon dioxide

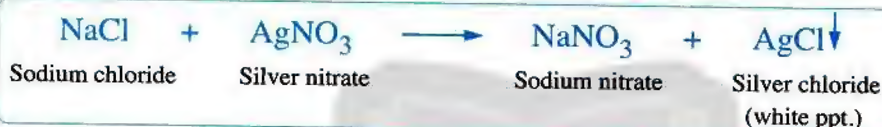
C Reaction between two salt solutions

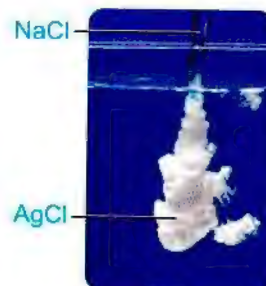
The reaction between two salt solutions is accompanied by formation of **a precipitate (ppt.)** [a salt doesn't dissolve in water].

Example

Reaction between sodium chloride solution and silver nitrate solution :

Sodium chloride solution reacts with silver nitrate solution to give sodium nitrate solution and a white precipitate of silver chloride.





G.R. ***A white precipitate is formed on adding silver nitrate solution to sodium chloride solution.***

Due to the formation of silver chloride salt which doesn't dissolve in water.

THIRD Oxidation and reduction reactions

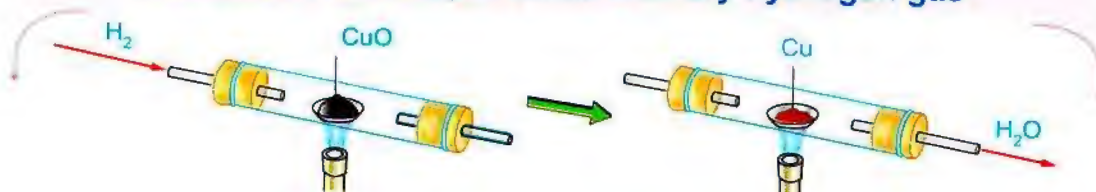
Oxidation and reduction according to

1. Traditional concept
2. Electronic concept

1 Oxidation and reduction according to the traditional concept (by giving and taking away oxygen or hydrogen)

Oxidation and reduction processes can be understood according to the traditional concept by studying the following chemical reaction :

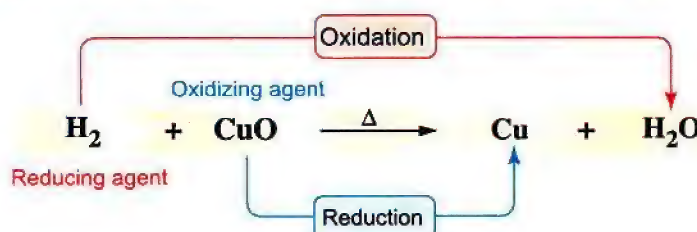
Reaction of hot copper oxide with dry hydrogen gas



Reduction of copper oxide by hydrogen gas

On passing hydrogen through hot copper oxide, hydrogen takes the oxygen away from copper oxide forming water vapour and black copper oxide turns into red copper.

* The previous reaction is expressed by the following equation :



Hydrogen	Copper oxide
* An oxidation process occurs to hydrogen **G.R.** Because it combines (unites) with oxygen.	* A reduction process occurs to copper oxide **G.R.** Because oxygen is taken away from it.
Therefore	
* Hydrogen is considered as a **reducing agent** **G.R.** Because it took oxygen away from copper oxide.	* Copper oxide is considered as an **oxidizing agent** **G.R.** Because it gave oxygen to hydrogen.

* From the previous example, we can conclude the following concepts according to the traditional concept :

Reducing agent (factor)

It is the substance which takes oxygen away or gives hydrogen during a chemical reaction.

occurs to it

Oxidation

A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance.

Oxidizing agent (factor)

It is the substance which gives oxygen or takes hydrogen away during a chemical reaction.

occurs to it

Reduction

A chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance.

Question 3

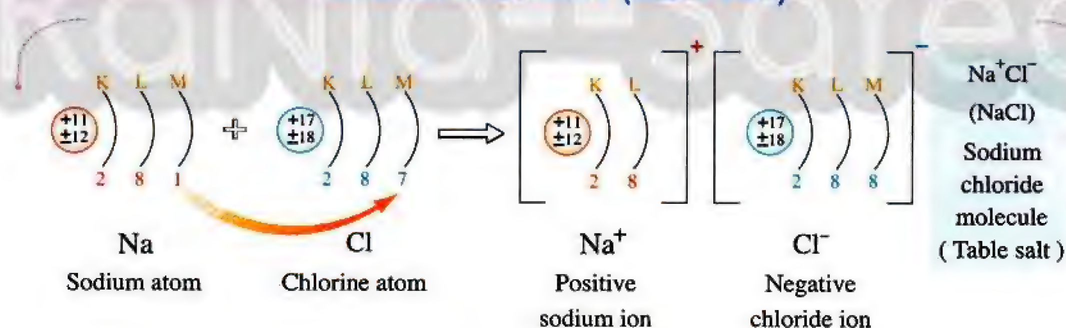
Complete the following table :

The reaction :	**Reaction of carbon with copper oxide to form copper and carbon dioxide.**
The equation :	$2CuO + C \longrightarrow 2Cu + CO_2$ (upper arrow: .... process; lower arrow: .... process)
The oxidizing agent :	....
The reducing agent :	....

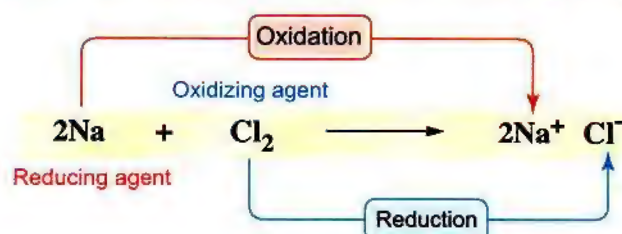
2 Oxidation and reduction according to the electronic concept (by losing and gaining electrons)

The modern electronic theory introduces a more accurate concept for oxidation and reduction, where there are oxidation and reduction reactions don't include oxygen or hydrogen as in the following example :

Reaction of sodium atom and chlorine atom to form sodium chloride molecule (table salt)



✲ The previous reaction is expressed by the following equation :



Sodium

Chlorine

* An oxidation process occurs to sodium

G.R.

Because it loses an electron and changes into a positive sodium ion.

$$2Na \longrightarrow 2Na^+ + 2e^-$$

* A reduction process occurs to chlorine

G.R.

Because it gains an electron (which is lost by sodium) and changes into a negative chloride ion.

$$Cl_2 + 2e^- \longrightarrow 2Cl^-$$

Therefore

* Sodium is considered as a **reducing agent** **G.R.**

Because it loses an electron during the chemical reaction and changes into a positive sodium ion.

* Chlorine is considered as an **oxidizing agent** **G.R.**

Because it gains an electron during the chemical reaction and changes into a negative chloride ion.

※ From the previous example, we can conclude the following concepts according to the electronic concept :

Reducing agent (factor)

It is the substance which loses an electron or more during a chemical reaction.

occurs to it

Oxidation

A chemical process where the atom loses an electron or more.

Oxidizing agent (factor)

It is the substance which gains an electron or more during a chemical reaction.

occurs to it

Reduction

A chemical process where the atom gains an electron or more.

G.R.

- ***Oxidation and reduction are concurrent processes as they occur at the same time.***

  Because the number of gained electrons in reduction process equals the number of lost electrons in oxidation process.

- ***Most metals are strong reducing agents, while most nonmetals are strong oxidizing agents.***

  Because metals tend to lose electrons during the chemical reaction, while nonmetals tend to gain electrons during the chemical reaction.

Note

Any chemical process includes

Losing of electrons is known as an oxidation process	Gaining of electrons is known as a reduction process

Examples

* $Cu \xrightarrow{Oxidation} Cu^{+2} + 2e^-$

* $F^- \xrightarrow{Oxidation} F + e^-$

* $Ag^+ + e^- \xrightarrow{Reduction} Ag$

* $Br + e^- \xrightarrow{Reduction} Br^-$

Exercise 1

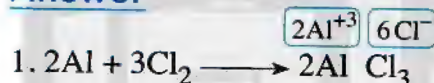
Using the opposite table, answer the following questions :

1. Write the equation of the reaction of aluminium with chlorine.

2. Determine the oxidizing agent and the reducing agent.

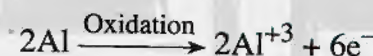
Element	Atomic number	Electronic configuration		
		K	L	M
Al	13	2	8	3
Cl	17	2	8	7

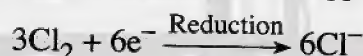
Answer


1. $2Al + 3Cl_2 \longrightarrow 2Al\ Cl_3$ ($2Al^{+3}$, $6Cl^-$)

2. • Reducing agent : Aluminium Al

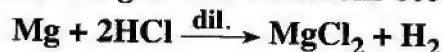
• Oxidizing agent : Chlorine Cl_2


$2Al \xrightarrow{Oxidation} 2Al^{+3} + 6e^-$


$3Cl_2 + 6e^- \xrightarrow{Reduction} 6Cl^-$

Exercise 2

In the following reaction, lost and gained of electrons occurred :


$$Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2$$

1. What is the type of this reaction ?

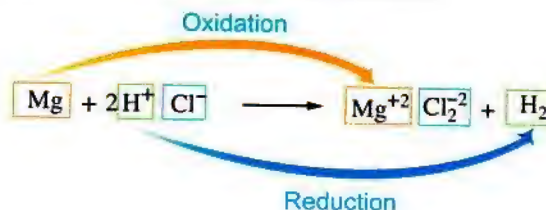
2. Show the oxidation and reduction processes on the equation of the reaction.

3. Determine the oxidizing agent and the reducing agent (Giving reason). [Mg = 12 & H = 1]

Answer

1. Simple substitution reaction (oxidation & reduction).

2.



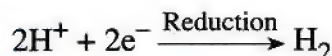
3. • **Reducing agent :**

Magnesium atom (Mg), because it loses two electrons during the chemical reaction and changes into positive magnesium ion (Mg^{+2}).

$Mg \xrightarrow{Oxidation} Mg^{+2} + 2e^-$

• **Oxidizing agent :**

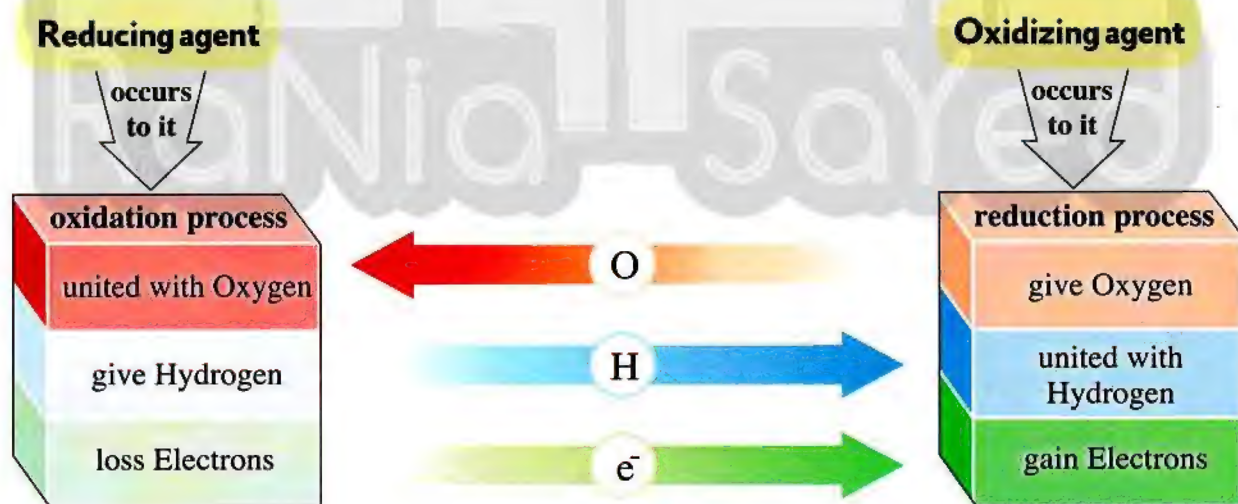
Hydrogen ion (H^+), because it gains two electrons during the chemical reaction and changes into hydrogen molecule (H_2).


$2H^+ + 2e^- \xrightarrow{Reduction} H_2$

Question 4

Show which of the following reactions represents oxidation process and which of them represents reduction process.

1. $Mg \longrightarrow Mg^{+2} + 2e^-$ (..............................)
2. $Cl_2 + 2e^- \longrightarrow 2Cl^-$ (..............................)
3. $Fe^{+2} \longrightarrow Fe^{+3} + e^-$ (..............................)
4. $N^{-2} + e^- \longrightarrow N^{-3}$ (..............................)



TRY to answer worksheet 2 in the Notebook

Remember

Lesson One

Chemical reaction :

It is the breaking up of bonds in the reactants molecules and formation of new bonds in the products (resultants) molecules from the reaction.

Types of chemical reactions :

1. Thermal decomposition reactions :

They are chemical reactions which involve the breaking up of the compounds with the effect of heat into its primary elements or simpler compounds than the original ones.

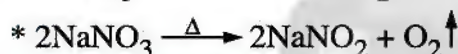
Examples :

* $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

* $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

* $CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

* $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$


* $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

2. Substitution reactions :

Chemical activity series :

It is the arrangement of metals in a descending order according to the degree of their chemical activity.

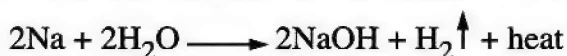
Types of substitution reactions :

A. Simple substitution reactions :

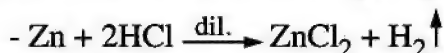
They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.

Types of simple substitution reactions :

a. A metal substitutes the hydrogen of water :


$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$

b. A metal substitutes the hydrogen of acid :


- $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

- $2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

- $Cu + HCl \xrightarrow{dil.}$ No reaction

c. A metal substitutes another one in its salt solution.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

B. Double substitution reactions :

They are chemical reactions in which double substitution (exchange) occurs between the ions of two different compounds to give two other new compounds.

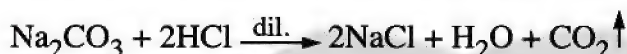
Types of double substitution reactions :

a. Reaction between an acid and an alkali (neutralization reaction) :

It is the reaction between an acid and an alkali to form salt and water.

$NaOH + HCl \longrightarrow NaCl + H_2O$

b. Reaction between an acid and a salt :



$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

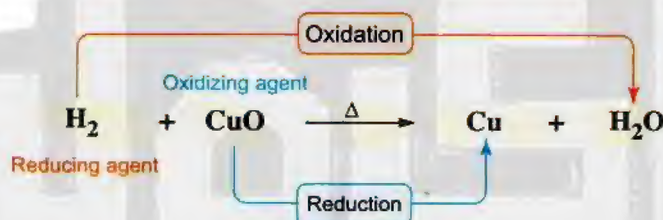
c. Reaction between two salt solutions :

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

C. Oxidation and reduction processes according to :

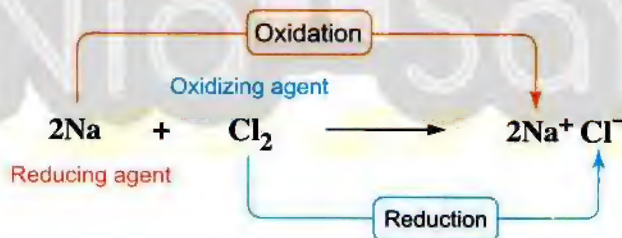
a. Traditional concept (by giving and taking away oxygen or hydrogen).

Ex.



b. Electronic concept (by losing and gaining electrons).

Ex.



- **Oxidation and reduction are concurrent processes , as they occur at the same time.**

Questions ? on lesson One

Interactive Exercises

● Remember ● Understand ● Apply ● Higher skills School book questions.

1. Choose the correct answer :

1. In the thermal decomposition reactions, the compound decomposes by heat into its ....
   a. simple components. b. primary elements.
   c. other compounds. d. all the previous answers. *(Gharbia 2017)*
2. When we heat mercuric oxide, we get .... *(Matrouh 2019)*
   a. mercuric oxide and water. b. mercuric oxide and oxygen.
   c. mercury and hydrogen. d. mercury and oxygen.
3. When copper hydroxide is heated, we obtain .... *(Suez 2015 / Port Said 2017)*
   a. copper carbonate and water. b. copper oxide and water.
   c. copper oxide and hydrogen. d. copper and hydrogen.
4. When calcium carbonate is heated, ... are obtained. *(Assiut 2015 / Alex. 2017)*
   a. calcium bicarbonate and carbon dioxide
   b. calcium hydroxide and carbon dioxide
   c. calcium oxide and carbon monoxide
   d. calcium oxide and carbon dioxide
5. On heating copper carbonate, the colour changes from ....
   a. blue to black. b. green to black. c. black to green. d. green to blue.
6. Most metal sulphates decompose when they are heated to metal oxide and .... gas.
   a. CO_2 b. O_2 c. SO_2 d. SO_3 *(Damietta 2011)*
7. On heating copper sulphate, a .... colour is formed. *(Dakahlia 2021 / Behira 2018)*
   a. black b. green c. blue d. red
8. Copper sulphate is decomposed by heat into .... *(Assiut 2016 / Kafr El Sheikh 2017)*
   a. black copper oxide only.
   b. sulphur trioxide gas only.
   c. sulphur dioxide gas and black copper oxide.
   d. black copper oxide and sulphur trioxide gas.
9. Some metal nitrates are decomposed by heat into .... *(Dakhalia 2017)*
   a. metal nitrite and oxygen gas. b. metal nitrate and oxygen gas.
   c. nitrogen oxide and oxygen gas. d. metal nitrate and water.
10. The oxygen (O_2) evolves by heating .... compound. *(Fayoum, Cairo 2021)*
    a. $NaNO_3$ b. $CuSO_4$ c. $CuCO_3$ d. $Cu(OH)_2$

11. Carbon dioxide evolves during thermal decomposition of .... compound. *(Suez 2019)*
 a. HgO b. $CuSO_4$ c. $CuCO_3$ d. $Cu(OH)_2$

12. On heating sodium nitrate, a .... colour is formed.
 a. white b. black c. yellowish white d. blue

13. All of the following compounds give black precipitate on heating except ....
 a. HgO b. $Cu(OH)_2$ c. $CuCO_3$ d. $CuSO_4$

14. From the compounds which decompose by heat into metal and oxygen is .... *(Giza 2016)*
 a. $Cu(OH)_2$ b. $CuSO_4$ c. $CuCO_3$ d. HgO

15. Some metal nitrates decomposed by heat and .... gas evolves. *(Sharkia 2016)*
 a. SO_3 b. SO_2 c. O_2 d. CO_2

16. When there is a sudden decrease in the car speed, the sodium azid is decomposed into .... gas. *(Qalyoubia 2019 / Ismailia 2021)*
 a. N_2 b. H_2 c. O_2 d. CO_2

17. The arrangement of metals in a descending order according to the degree of their chemical activity is called .... *(South Sinai 2014 / Fayoum 2016)*
 a. chemical activity series. b. positive ions.
 c. free atoms. d. negative ions.

18. Substitution reactions take place on replacing .... *(Sohag 2016)*
 a. less active element with more active one.
 b. less active compound with more active element.
 c. more active element with less active one.
 d. more active compound with less active element.

19. Active metals react with water as they substitute hydrogen of water forming .... and hydrogen gas evolves. *(Qalyoubia , Gharbia 2017)*
 a. metal oxide b. metal nitrate c. metal hydroxide d. metal nitrite

20. All of the following metals replace hydrogen of the acid except .... *(Damietta 2021)*
 a. Sn b. Au c. Zn d. Al

21. From the following metals, the most active one in the chemical activity series is ....
 a. copper. b. sodium. c. hydrogen. d. aluminium.
 (Sharkia 2018)

22. Double substitution reactions between two salt solutions are accompanied by formation of .... *(Giza 2018)*
 a. a metal. b. a precipitate. c. an oxide. d. a nonmetal.

23. The reaction in which double substitution occurs between the ions of two compounds to form two new compounds is called .... reaction. *(Dakahlia 2018)*
 a. double substitution b. simple substitution
 c. neutralization d. oxidation and reduction

24. $2Na + 2H_2O \longrightarrow 2NaOH$ + heat + ... ↑ *(Giza 2014 / Cairo 2017)*
a. O_2 b. H_2 c. Cl_2 d. N_2

25. Zinc reacts with diluted hydrochloric acid and .... salt is formed.
a. zinc chloride b. zinc sulphate c. zinc nitrate d. zinc oxide

26. The metal which can't replace the hydrogen of the acid is .... *(Suez 2011)*
a. aluminium. b. zinc. c. copper. d. sodium.

27. On adding copper turnings to diluted hydrochloric acid, ... is produced.
a. copper hydroxide b. copper carbonate c. copper chloride d. no reaction
(Sharkia 2021 , 2019)

28. Sodium metal can replace all of the following metals from their salt solutions except .... *(Matrouh 2018 / Fayoum 2019)*
a. copper. b. potassium. c. magnesium. d. zinc.

29. Magnesium can replace .... in its salt solution. *(Suez 2017)*
a. sodium b. potassium c. copper d. calcium

30. When hydrochloric acid reacts with sodium carbonate, then the reaction produces gas which .... *(Qalyoubia 2018 / Gharbia 2019)*
a. turbids limewater. b. burns with a pop sound.
c. increases ignition. d. makes its colour red.

31. When magnesium replaces copper in its salt solution, a .... precipitate is formed.
a. black b. red *(Gharbia 2021 / Qena 2019)*
c. blue d. green

32. The reaction between an acid and an alkali gives .... *(Sohag 2014)*
a. salt and water. b. salt and hydrogen.
c. salt and oxygen. d. oxygen and hydrogen.

33. The reaction of an acid with an alkali to give salt and water is known as ....
a. oxidation and reduction reaction. b. thermal decomposition reaction.
c. neutralization reaction. d. simple substitution reaction.
(Damietta 2021 / Menia 2019)

34. On adding silver nitrate solution to sodium chloride solution, ... is formed. *(Cairo 2019)*
a. a white precipitate of sodium nitrate b. a white precipitate of silver chloride
c. a blue precipitate of silver chloride d. no precipitate

35. Clear limewater turbids on passing .... gas through it. *(Red Sea 2017 , 2019)*
a. nitrogen dioxide b. sulphur dioxide
c. carbon dioxide d. (a) and (b) are correct

36. In the reaction : $H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$ - The reducing agent is .... *(Beni Suef 2019)*
a. H_2 b. CuO c. Cu d. H_2O

37. During the reaction between hydrogen and black copper oxide, ... process occurs for copper oxide. *(Qalyoubia 2017 / Qena 2018)*
a. oxidation
b. reduction
c. oxidation and reduction
d. no reaction

38. Reaction of hydrogen gas with hot copper oxide is called .... reaction. *(Assiut 2018)*
a. oxidation and reduction
b. double substitution
c. neutralization
d. thermal decomposition

39. The oxidizing agent is the substance which .... during a chemical reaction. *(Qena 2014)*
a. gives oxygen
b. removes hydrogen
c. loses hydrogen
d. (a) and (b)

40. Oxidation is a chemical process which involves an increase in the percentage of .... gas.
a. helium
b. hydrogen
c. oxygen
d. fluorine
(Port Said 2017 / Sohag 2019)

41. In the reaction : $2Na + Cl_2 \longrightarrow 2NaCl$, we can say that sodium ($_{11}Na$) is a reducing factor because it .... *(Assiut 2011)*
a. unites with oxygen.
b. loses one electron.
c. gains one electron.
d. gains hydrogen.

42. The reaction : $Cl_2 + 2e^- \longrightarrow 2Cl^-$, represents .... process. *(Giza 2019)*
a. oxidation
b. reduction
c. decomposition
d. substitution

43. In the following reaction : $2Br^- \longrightarrow Br_2 + 2e^-$, what will happen to bromide ion ? ....
a. Oxidation.
b. Reduction.
c. Oxidation and reduction.
d. Neutralization. *(Behira 2019)*

44. When sodium atom loses an electron from its outermost energy level, it becomes ....
a. oxidized only.
b. reducing agent only.
c. reduced only.
d. (a) and (b) are correct. *(Menofia 2019)*

45. All of the following represents reduction process except .... *(Beni Suef 2017 / Ismailia 2019)*
a. decreasing oxygen.
b. gives up electrons.
c. gains electrons.
d. combination with hydrogen.

2. Choose from columns (B) and (C) what suit them in column (A), then write the complete statements : *(Damietta 2016 / 2018)*

(A) The reaction	(B) Gas produced	(C) Type of reaction
1. Reaction of sodium carbonate salt with dil. hydrochloric acid.	A. $H_2 \uparrow$	a. Thermal decomposition.
2. Reaction of zinc with dil. hydrochloric acid.	B. $O_2 \uparrow$	b. Precipitation reaction.
3. Heating of copper sulphate.	C. $CO_2 \uparrow$	c. Simple substitution.
	D. $SO_3 \uparrow$	d. Double substitution.
		e. Direct combination.

3. Correct the underlined words :

1. Most metal carbonates decompose by heating into **metal** and carbon dioxide. *(Alex. 2021 / Fayoum 2019)*
2. Most metal sulphates decompose by heating into metal oxide and **nitrogen** gas. *(Red Sea 2018)*
3. In C.A.S., metals are arranged in a descending order according to their **atomic weights**. *(New Valley 2018)*
4. $2Na + 2H_2O \longrightarrow 2NaOH + \mathbf{O_2}\uparrow + heat$ *(Sharkia 2021 / Giza 2018)*
5. Some metals react with water to produce metal **oxide** and hydrogen gas evolves. *(Beni Suef 2018)*
6. Metals substitute **oxygen** of water to produce the metal hydroxide. *(Fayoum 2019)*
7. On adding diluted hydrochloric acid to zinc a salt and **water** are formed. *(Giza 2015)*
8. When adding magnesium pieces to copper sulphate solution, a **black** precipitate is formed. *(Giza 2018 / Damietta 2019)*
9. Clear limewater turbids on passing **oxygen** gas through it. *(Fayoum , Gharbia 2014)*
10. The reaction between an acid and an alkali forming salt and water is called **oxidation** reaction. *(Luxor 2013)*
11. When we add silver nitrate solution to sodium chloride solution, a **brown** precipitate of silver chloride is formed. *(Giza , Gharbia 2019)*
12. Sodium is monovalent, because it **gains** one electron. *(Dakahlia 2021 / Fayoum 2018)*
13. **Oxidizing agent** is the substance which loses an electron or more during a chemical reaction. *(Port Said 2014)*
14. **Oxidation** is a chemical process in which an atom gains one electron or more. *(Gharbia 2016 / Matrouh 2019)*
15. In the reaction : $H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$ **Hydrogen** is an oxidizing agent. *(Menia 2016)*
16. **Oxidizing agent** is a chemical process in which an atom of the element loses an electron or more. *(Assiut 2018)*
17. $Fe + 2HCl \xrightarrow{dil.} \mathbf{Fe_2Cl_3} + H_2\uparrow$ *(Sharkia 2015)*

4. Put (✓) or (×), then correct what is wrong :

1. Chemical reaction is a process of breaking up of bonds between molecules of reactants and formation of new bonds between molecules of products. *(Gharbia 2021)* (   )
2. Copper sulphate is decomposed by heat into black copper oxide and sulphur dioxide gas. *(Sohage , Qena 2018)* (   )
3. Some metal nitrates decompose by heat into metal nitrate and hydrogen gas evolves. *(Qalyoubia 2019)* (   )
4. Aluminium reacts with diluted hydrochloric acid faster than the reaction of zinc with the same acid. *(Matrouh 2018)* (   )

5. Copper replaces gold in its salt solutions, while the opposite doesn't occur. ( )
6. Both magnesium and zinc can replace copper in copper sulphate solution. ( )
7. Double substitution reaction occurs between the atoms of two compounds. ( )
8. Double substitution reaction between two salt solutions is accompanied with the formation of a precipitate. *(Sohag 2019)* ( )
9. In the reaction of hydrogen with hot copper oxide, hydrogen is oxidized as it is considered as a reducing agent. ( )
10. The change of copper oxide into copper is considered an oxidation process. ( )
11. In oxidation and reduction reactions, the number of lost electrons is less than the number of gained electrons. ( )
12. Chlorine atom changes into chloride ion when it loses an electron. *(Alex. 2012)* ( )
13. Sodium ion is a positive ion (Na^+) as it accepts an electron. ( )
14. Oxidation and reduction are separated processes. *(Qena 2021 / South Sinai 2014)* ( )

5. Write the scientific term of each of the following statements :

1. The breaking up of bonds between molecules of the reactants and formation of new bonds between the molecules of the products. *(Qena 2021 / South Sinai 2019)*
2. Chemical reactions in which the compound is decomposed by heat into simple components. *(Qalyoubia 2017 / South Sinai 2018)*
3. • The arrangement of metallic elements in a descending order according to the degree of their chemical activity. *(Alex. , Qalyoubia 2021)*
   • It is the arrangement of the metals in a descending order according to their chemical activity where the element which is more active substitutes the less active one. *(Dakahlia 2018)*
4. • Chemical reactions in which an element substitutes another one. *(Qena 2019)*
   • They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.
5. • Chemical reactions in which a change happens between the two radicals (ions) of the two compounds to form another two compounds. *(Fayoum 2019)*
   • The reactions which involve double exchange between the ions of two compounds to give two new compounds. *(Cairo 2017 , 2018)*
6. The reaction of an acid and an alkali to give salt and water. *(Dakahlia 2021 / South Sinai 2019)*
7. • A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance. *(Red Sea 2018 / South Sinai 2019)*
   • A chemical process where the atom loses an electron or more. *(Matrouh 2018 / Cairo 2019)*
8. • A chemical process which causes the decrease in the oxygen content or the increase in the hydrogen content in a substance. *(Cairo , Giza 2021)*
   • A chemical process in which an atom of the element gains one electron or more. *(Suez 2021 / Beni Suef 2019)*

9. • The substance which gives oxygen or takes hydrogen away during a chemical reaction. *(Giza , Qena 2019)*

• The substance which gains an electron or more during a chemical reaction. *(Qalyoubia 2017 / Cairo 2018)*

10. • It is the substance which loses an electron or more during a chemical reaction. *(Fayoum 2021 / Gharbia 2019)*

• The substance which takes oxygen away or gives hydrogen during a chemical reaction. *(Giza 2014 / Assiut 2018)*

11. The process of changing Fe^{+2} to Fe^{+3} according to the equation :
$Fe^{+2} \longrightarrow Fe^{+3} + e^-$ *(Cairo 2015)*

6. Complete the following statements :

1. The breaking up of bonds in the molecules of reactants and formation of new bonds is called .... *(Assiut , Gharbia 2019)*
2. The plant formed its food during photosynthesis process from the reaction between .... and .... *(Red Sea 2017)*
3. During .... reactions, the compound is decomposed by heat into its simple components. *(Assiut , Sharkia 2019)*
4. Some metal oxides decompose by heat into .... and ....
5. Copper hydroxide is decomposed by heat into .... and .... *(Qena 2015)*
6. On heating copper hydroxide, the colour changes from .... to ....
7. Most metal carbonates undergo thermal decomposition into .... and .... *(Luxor 2013)*
8. Copper oxide has .... colour, while copper carbonate has .... colour.
9. The gas that evolves on thermal decomposition of metal oxide is ...., while the gas that evolves on thermal decomposition of metal carbonate is ....
10. The .... colour of copper sulphate changes into black by heating due to the formation of ....
11. .... gas evolves when sodium reacts with water, while on heating blue copper sulphate .... gas evolves. *(Luxor 2019)*
12. Most metal .... decomposed when heated to .... and sulphur trioxide. *(Matrouh 2019)*
13. The arrangement of metals in a descending order according to their chemical activity is called .... *(Cairo 2012)*
14. In simple substitution reactions, the substituting element is .... active than the .... one.
15. Sodium reacts with water giving .... and .... gas evolves. *(Cairo , Matrouh 2018)*
16. Reaction of zinc with diluted hydrochloric acid is from .... reactions, while that between sodium carbonate and the same acid is from .... reactions.
17. Magnesium reacts with blue copper sulphate solution and a .... precipitate of .... is formed. *(Cairo 2017)*

18. .... is the reaction between an acid and an alkali to form salt and water. *(Suez , New Valley 2019)*
19. Sodium carbonate reacts with dil. hydrochloric acid and .... gas evolves which .... the clear limewater.
20. Zinc reacts with diluted hydrochloric acid forming a salt called .... *(Port Said 2018)*
21. .... gas turbids clear limewater, while .... gas increases the glow of a burning match. *(Gharbia 2018 / Qena 2019)*
22. The reaction between two salt solutions is accompanied by the formation of .... *(Gharbia 2021 / Behira 2019)*
23. On adding silver nitrate solution to sodium chloride solution, a .... precipitate of .... is formed.
24. On passing hydrogen gas over hot copper oxide, copper oxide is converted into .... *(Alex. 2012)*
25. In the following reaction : $H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$
    a. Hydrogen undergoes .... process, while copper oxide undergoes .... process. *(Damietta 2015 / Suez 2016)*
    b. Hydrogen is considered as .... agent, while copper oxide is considered as .... agent.
26. .... is the substance which gives oxygen or takes hydrogen away. *(South Sinai 2021 / Ismailia 2019)*
27. A chemical process in which the atom loses an electron or more is known as ....
28. In the following reaction : $2CuO + C \xrightarrow{\Delta} 2Cu + CO_2\uparrow$
    a. Copper oxide undergoes .... process and considered as .... agent.
    b. Carbon undergoes .... process and considered as .... agent. *(Menia 2018)*
29. In the equation [$2Na + Cl_2 \longrightarrow 2NaCl$] .... process happens to chlorine. *(Alex. 2019)*
30. On combination of sodium atom ($_{11}Na$) with chlorine atom ($_{17}Cl$), ... is considered as an oxidizing agent, while .... is considered as a reducing agent. *(Red Sea 2018 / Sohag 2019)*
31. Oxidation is a chemical process where the atom .... an electron or more. *(Fayoum 2016 / Red Sea 2019)*
32. .... is the substance which gains one electron or more during a chemical reaction. *(Luxor 2013)*
33. .... is the substance which loses one electron or more during a chemical reaction. *(Alex. 2014 / Menia 2017)*
34. .... process takes place for the reducing agent, while .... process takes place for the oxidizing agent during a chemical reaction.
35. Oxidation and reduction are two .... processes. *(Assiut 2016 / Sohag 2018)*
36. During oxidation and reduction process, metals are considered .... factors, while nonmetals are considered .... factors. *(Red Sea 2016)*

7. Complete the following equations, then mention the type of each reaction :

1. $2HgO \xrightarrow{\Delta}$ .... + ... [ ] *(Red Sea 2018 / New Valley 2019)*
2. $Cu(OH)_2 \xrightarrow{\Delta}$ .... + ... [ ] *(Ismailia , Fayoum 2018)*
3. $CuCO_3 \xrightarrow{\Delta}$ .... + ... [ ] *(Aswan , Matrouh 2019)*
4. $2NaNO_3 \xrightarrow{\Delta}$ .... + ... [ ] *(Behira 2021 / Menia 2019)*
5. $CuSO_4 \xrightarrow{\Delta} CuO +$ .... [ ] *(Red Sea 2017 / Assiut 2019)*
6. .... $\xrightarrow{\text{electric spark}} 2Na + 3N_2\uparrow$ *(Ismailia, Menia 2016)*
7. $2Na + 2H_2O \longrightarrow$ .... + ... + heat [ ] *(Dakhalia 2017 / Sohag 2018)*
8. $Zn + 2HCl \xrightarrow{\text{dil.}}$ .... + ... [ ] *(Cairo , South Sinai 2019)*
9. $2Al + 6HCl \xrightarrow{\text{dil.}}$ .... $+ 3H_2\uparrow$ [ ] *(Luxor , Sharkia 2019)*
10. $Mg + 2HCl \xrightarrow{\text{dil.}}$ .... + ... [ ] *(Qena 2011)*
11. $Mg + CuSO_4 \longrightarrow$ .... + ... [ ] *(Behira 2021 / North Sinai 2019)*
12. .... + ... $\longrightarrow NaCl + H_2O$ [ ] *(Giza , Aswan 2019)*
13. $Na_2CO_3 +$ .... $\longrightarrow 2NaCl + H_2O + CO_2\uparrow$ [ ] *(Giza 2018 / Damietta 2019)*
14. $NaCl + AgNO_3 \longrightarrow$ .... + ... [ ] *(Cairo 2021 , Red Sea 2019)*
15. .... $+ H_2 \xrightarrow{\Delta} H_2O + Cu$ [ ] *(Menofia 2017)*
16. .... + ... $\longrightarrow 2NaCl$ [ ]
17. $_{11}Na \longrightarrow$ .... $+ e^-$ [ ] *(Menia 2013)*

8. Give reasons for (write the balanced chemical equations whenever possible) :

1. Formation of silvery colour on heating red mercuric oxide. *(Cairo 2021 / Dakahlia 2018)*
2. Formation of black substance by heating blue copper hydroxide. *(Behira 2021)*
3. The blue colour of copper sulphate turns into black by heating. *(Port Said 2013 / Gharbia 2016)*
4. A black substance is formed on heating green copper carbonate. *(Fayoum 2014)*
5. A yellowish white colour is formed on heating white sodium nitrate.
6. The arrangement of metallic elements in C.A.S. *(Kafr El-Sheikh 2016)*
7. Both aluminium and zinc react with diluted hydrochloric acid.
8. Copper doesn't react with dil. hydrochloric acid, whereas zinc reacts with it. *(Fayoum 2019)*
9. Gold does not react with diluted acids. *(Aswan , South Sinai 2019)*
10. • Although aluminium comes before zinc in the chemical activity series, aluminium delays after zinc in the reaction with diluted hydrochloric acid. *(Giza , Qalyoubia 2016 / Alex., Menofia 2017)*
    • To slow start of the reaction between aluminium and hydrochloric acid practically. *(Menofia 2021)*

11. Magnesium replaces the hydrogen of dil. acids. *(Suez 2018)*
12. Magnesium substitutes copper in copper sulphate solution, while the opposite cannot happen. *(Beni Suef, Qena 2018)*
13. Occurrence of reaction between magnesium and copper sulphate solution. *(Cairo 2018)*
14. • A red precipitate is formed when magnesium is added to copper sulphate solution. *(Cairo , Sharkia 2019)*

    • The blue colour of copper sulphate disappears on putting a piece of magnesium in it. *(Red Sea 2021 / New Valley 2019)*
15. Not keeping silver nitrate solution in an aluminium containers. *(Ismailia, Gharbia 2021 / Luxor 2019)*
16. The occurrence of effervescence on putting a piece of aluminium in diluted hydrochloric acid. *(Menofia , Fayoum 2018)*
17. A white precipitate is formed on adding silver nitrate solution to sodium chloride solution. *(Suez 2021 / Dakahlia 2019)*
18. In the reaction : $H_2 + CuO \xrightarrow{\Delta} H_2O + Cu$; Hydrogen is considered as a reducing agent, while copper oxide is considered as an oxidizing agent. *(Beni Suef 2013)*
19. In the reaction : $2Na + Cl_2 \longrightarrow 2NaCl$ sodium is considered as a reducing agent, while chlorine is considered as an oxidizing agent. *(Kafr El-Sheikh 2017 / Menia 2019)*
20. On the reaction between sodium with chlorine to form sodium chloride, oxidation and reduction process occurs, although there is no oxygen. *(Beni Suef 2014)*
21. Most metals are strong reducing agents, while most nonmetals are strong oxidizing agents.
22. Oxidation and reduction are concurrent processes that happen at the same time. *(Fayoum 2014)*

9. Illustrate by balanced symbolic chemical equations the following reactions :

1. How can you obtain mercury from red mercuric oxide? *(Behira 2019)*
2. The effect of heat on red mercuric oxide. *(Qalyoubia , Kafr El-Sheikh 2018)*
3. Obtaining oxygen gas from sodium nitrate. *(Dakahlia 2019)*
4. White colour compound when heated it turns into yellowish white colour, and a gas needed for respiration of the living organisms evolves. *(Menofia 2019)*
5. The effect of heat on sodium nitrate. *(Qena 2021 / Damietta 2019)*
6. The effect of heat on copper hydroxide *(Dakahlia , South Sinai 2019)*
7. Green colour compound when heated it turns into black colour, and a gas turbid limewater evolves. *(Menofia 2019)*
8. The effect of heat on copper carbonate. *(Sohag , Port Said 2019)*
9. The effect of heat on copper sulphate. *(Matrouh 2018 / Qena 2019)*
10. The reaction of water with sodium (what are the required precautions for the reaction?). *(Cairo 2021 / Red Sea 2019)*

11. The reaction of zinc with diluted hydrochloric acid. *(New Valley 2017 / Dakahlia 2019)*
12. Adding of aluminium turnings to diluted hydrochloric acid. *(Port Said 2019)*
13. How can you obtain copper from copper sulphate solution. *(Behira 2019)*
14. On adding pieces of magnesium to a solution of a chemical substance, a red precipitate is formed, while no reaction happens by adding a piece of silver to the same solution. *(Alex. 2019)*
15. Placing of a piece of magnesium in a solution of copper sulphate. *(Cairo 2021 / Port Said 2019)*
16. The substitution of a metal instead of another one in one of its salt solution. *(Menofia 2016 / Sohag 2018)*
17. • The reaction of dil. hydrochloric acid with sodium hydroxide (what is the name of the reaction). *(Sohag . Qena 2019)*
    • A neutralization reaction. *(Kafr El-Sheikh 2013 / Port Said 2018)*
18. Adding calcium hydroxide solution to diluted hydrochloric acid.
19. Evolving of carbon dioxide gas when diluted hydrochloric acid is added to one of sodium salts powder. *(Alex. 2019)*
20. The reaction of sodium carbonate with diluted hydrochloric acid. *(Dakahlia 2021 / North Sinai 2019)*
21. Adding silver nitrate solution to sodium chloride solution. *(Dakahlia 2021 / Sohag 2019)*
22. Compound used in cars air bag decompose rapidly and a gas evolves to fill the bag to protect the driver. *(Menofia 2019)*
23. Reduction of hot copper oxide by passing hydrogen gas. *(New Valley 2018 / Port Said 2019)*
24. Oxidation and reduction reaction. *(Port Said 2018)*

10. What is meant by each of the following ... ?

1. Chemical reaction. *(Assiut 2021 / Cairo 2019)*
2. Thermal decomposition reactions. *(Giza 2018)*
3. Chemical activity series. *(Cairo 2021 / Port Said 2019)*
4. Simple substitution reactions. *(Sohag 2011)*
5. Double substitution reactions. *(Cairo 2014)*
6. Neutralization reaction. *(Cairo , Ismailia 2019)*
7. Oxidation process. *(Behira 2021)*
8. Reduction process. *(Port Said 2021)*
9. Oxidizing agent. *(Sohag 2017)*
10. Reducing agent. *(Alex. 2021)*

(7–10) Concerning the traditional concept and electronic concept.

11. What happens when (write the balanced chemical equations whenever possible) ... ?

1. Heating of red mercuric oxide. *(Damietta , El-Menia 2021)*
2. Heating of copper hydroxide. *(Sharkia 2016)*
3. Heating of copper carbonate. *(Aswan 2021)*

4. Heating of blue copper sulphate. *(Suez 2021 / Giza 2017)*
5. Heating of sodium nitrate. *(South Sinai 2021)*
6. Putting a piece of sodium in water. *(Behira, El-Menia 2021)*
7. Adding diluted HCl to a piece of copper. *(Qalyoubia 2016 / New Valley 2017)*
8. Adding diluted HCl to a piece of zinc. *(Cairo, Aswan 2014)*
9. Adding HCl to sodium hydroxide.
10. Heating the solution resulting from the reaction between hydrochloric acid and sodium hydroxide. *(Red Sea 2018)*
11. Adding diluted HCl to sodium carbonate salt. *(Alex. 2021 / Behira 2017)*
12. Adding silver nitrate solution to sodium chloride solution. *(Qena 2019 / Cairo 2021)*
13. Placing a piece of magnesium ribbon in a solution of blue copper sulphate. *(Cairo, Qalyoubia 2021)*
14. Passing hydrogen gas over hot copper oxide. *(Gharbia 2016 / 2018)*
15. Sodium atom loses an electron during the chemical reaction (according to oxidation and reduction processes). *(New Valley, South Sinai 2017)*
16. An atom of an element gains an electron or more during the chemical reaction (according to oxidation and reduction processes). *(Qalyoubia 2017)*

12. Compare between :

1. Thermal decomposition of copper hydroxide and copper sulphate.
2. Heating of metal oxide and metal hydroxide. *(Giza, Sharkia, Gharbia 2019)*
3. Simple substitution reactions and double substitution reactions.
4. Oxidizing agent and reducing agent. *(Gharbia, Ismailia 2021)*
5. Oxidation and reduction processes concerning. *(Cairo, Giza, Damietta 2018)*
   - Traditional concept. *(Matrouh 2019)*
   - Electronic concept. *(Aswan, New Valley 2019)*

13. How can you differentiate between each of the following ... ?

1. Magnesium element and copper element (using dil. HCl).
2. Copper sulphate solution and magnesium sulphate solution (using a piece of zinc).
3. Silver nitrate and sodium nitrate (using sodium chloride).

14. Variant questions :

- **1. Mention the types of chemical reactions.**
- **2. There are in modern cars, an inflatable bag folded inside the stearing wheel known as air bag.**
  (a) Mention the importance of air bag. *(Kafr El-Sheikh 2021 / Behira 2017)*
  (b) Explain the idea of air bag operation. [Write the equation of the reaction that occurs inside it]

3. **From the two following chemical reactions :**

• $\boxed{A} + AgNO_3 \longrightarrow$ Precipitate + $\boxed{B}$

• $2\boxed{B} \longrightarrow 2NaNO_2 + \boxed{D}$

(a) Write the chemical formula of (A) and (B).

(b) What is the name of gas (D) and how do you detect it ?

(c) Write the chemical formula of the precipitate and its colour. *(Qalyoubia 2018)*

4. **Study the following reactions, then answer :** *(Behira 2018)*

❶ $\boxed{A} \xrightarrow{\Delta} H_2O\uparrow + CuO$

❷ $2Na + 2H_2O \longrightarrow 2NaOH + \boxed{B}\uparrow$ + heat

❸ $CuO + \boxed{B} \xrightarrow{\Delta} H_2O + \boxed{C}$

(a) Write the chemical formula for (A), (B) and (C).

(b) What is the type of the chemical reaction in ❶, ❷, ❸ ?

(c) What is the name of the process that happens to black copper oxide ? and why ?

5. **If you put an iron nail in a beaker containing diluted hydrochloric acid, you will observe evolving of gas bubbles.**

(a) What is the name of the evolved gas ? What is the type of the reaction ?

(b) Give a reason for the evolving of gas bubbles.

6. **Explain an activity to show the substitution of a metal instead of another one in its salt solution.** (Write the balanced symbolic equation) *(Menofia 2016)*

7. **If you have copper sulphate solution, pieces of magnesium, sodium nitrate, test tubes and a flame. Show by the balanced symbolic equations how to get :** *(Alex. 2018 / Gharbia 2019)*

(a) Copper metal. (b) Oxygen gas.

8. **One of students put an amount of sodium hydroxide solution in a test tube and added an amount of hydrochloric acid to it :** *(Menofia 2015)*

(a) Write the equation of the reaction. Mention the type of the reaction.

(b) What happens when adding an amount of silver nitrate solution to the produced solution ? (Write the equation of the reaction)

9. **A student poured some of blue copper sulphate solution in a beaker, then he added a piece of zinc. The student noticed that the disappearance of the blue colour of the solution and a red substance is formed at the bottom of the beaker.**

(a) Explain the disappearance of the blue colour and the formation of the red substance at the bottom of the beaker.

(b) What is the type of this reaction ?

10. If you have these chemicals in school laboratory : *(Gharbia 2021 / Fayoum 2019)*

Dil. hydrochloric acid - Silver nitrate - Sodium carbonate - Sodium chloride

Show by balanced symbolic equations how you get :

(a) A white precipitate. (b) A gas turbids limewater.

11. In the following reaction : *(Ismailia 2016 / Beni Suef 2018)*

Copper oxide (black) + Hydrogen $\xrightarrow{\Delta}$ Copper + Water

(a) What happens to black copper oxide ?

(b) What happens to hydrogen gas ?

(c) Write the chemical equation (symbolic and balanced) which expresses the chemical reaction.

(d) Why does black copper oxide act as an oxidizing agent and hydrogen gas act as a reducing agent ?

12. $2Na + Cl_2 \longrightarrow 2Na^+Cl^-$ *(Behira 2016)*

Study the previous reaction, then put (✓) or (×) in front of each of the following statements :

(a) Sodium is an oxidizing agent. ( )

(b) Chlorine is a reducing agent. ( )

(c) The change of the sodium atom into sodium ion represents oxidation process. ( )

(d) The change of the chlorine atom into chlorine ion is a reduction process. ( )

13. Determine the process of oxidation, reduction, oxidizing agent and reducing agent in the reaction of sodium with chlorine to form sodium chloride using the following table :

Element	Atomic number	Electronic configuration		
		K	L	M
Sodium (Na)	11	2	8	1
Chlorine (Cl)	17	2	8	7

(Cairo , Red Sea 2017 / South Sinai 2018)

14. Identify the oxidation and reduction according to the following equation :

$$Mg + Cl_2 \longrightarrow MgCl_2$$

(Matrouh 2015)

And also determine the reducing agent and oxidizing agent (giving a reason)

[knowing that : Atomic number of Mg = 12 & Cl = 17].

15. In the following reaction, lose and gain of electrons occur :

Magnesium + Copper sulphate ⟶ Magnesium sulphate + Copper

(a) Write the equation of the reaction. Mention the type of the reaction.

(b) Determine the oxidizing agent and reducing agent in this reaction (giving reason).

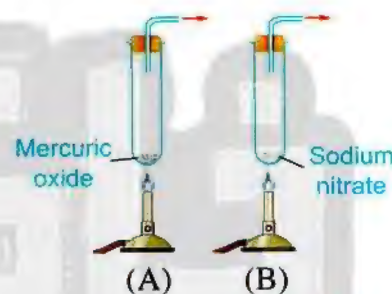
16. Find (exclude) the unsuitable word or statement then give the scientific term for the rest in the following : *(Menofia 2019)*

(a) Sodium - Lead - Copper - Aluminium.

(b) - A chemical process in which the hydrogen percentage increases.
- A chemical process in which the atom loses an electron or more.
- A chemical process in which oxygen percentage decreases.
- A process of converting hot copper oxide into copper when hydrogen gas passes through it.

15. Study the figures, then answer the questions :

1. From the opposite two figures :



(a) What is the colour of the substance in the tubes (A) & (B) before and after heating ?

(b) What is the name of the evolved gas ? How can you detect it ?

2. From the opposite figure :

(a) What is the type of the reaction ?

(b) What is the substance that was present in the test tube before heating ? (as you studied).

(c) Write the equation of the reaction.

(d) How can you detect the evolved gas ? *(Ismailia 2013)*

3. Determine the correct statements and the incorrect ones by using the opposite figure that shows a part of a chemical activity series : *(North Sinai 2013)*

A
B
Hydrogen
C
D

(a) Element (A) is more active than element (B).

(b) Element (C) can replace hydrogen of an acid.

(c) Element (A) can replace element (C) in its salt solution.

(d) Hydrogen is more active than element (B).

(e) Element (B) can replace hydrogen of diluted acids.

(f) Element (D) can replace element (B) in its salt solution.

(g) Element (C) can replace element (B) in its salt solution.

4. Rearrange the opposite elements in a descending order according to the degree of their chemical activity. *(Fayoum 2015)*

Al	Sn	Pb	Na	Ca	Fe

5. On adding diluted hydrochloric acid to commercial zinc (as shown in the figure), a gas is evolved : *(Suez 2018 / Sohag 2019)*

(a) What is the name of the gas, how can you detect it ?

(b) Write the symbolic balanced equation.
What is the type of the reaction ? *(Giza 2019)*

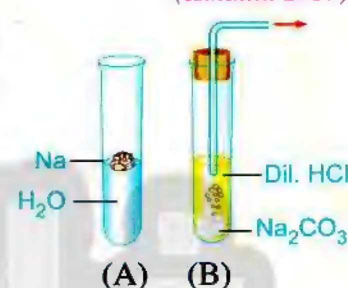
(c) What happens when replace Zn by copper turnings to the acid ? Why ?

6. From the opposite figures : *(Ismailia 2017)*

(a) What is the name of the resulted gas from the reaction (A) ?

(b) What is the name of the resulted salt from the reaction (B) ?

(c) Mention the type of the reaction happened in both tubes (A) and (B) showing that by symbolic equations.

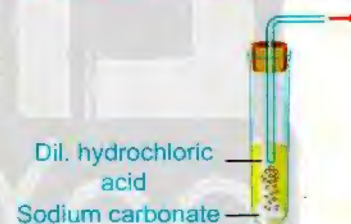


7. From the opposite figure : *(Ismailia 2015 / Red Sea 2018)*

(a) What is the name of the evolved gas ?

(b) How do you discover it ?

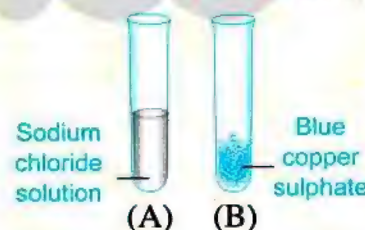
(c) Write the chemical equation of the reaction.
Mention the type of the reaction.



8. In the figure in front of you : *(Menofia 2017)*
Show by symbolic equations what happens when :

(a) Silver nitrate solution is added to the tube (A) ?

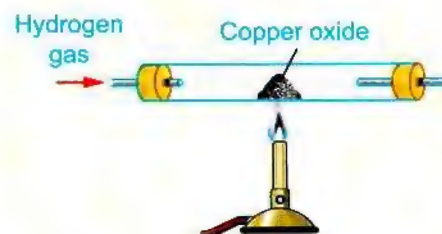
(b) Heating the tube (B) ?



9. In the opposite figure, hydrogen gas passes over hot copper oxide :

(a) What is the change in colour of copper oxide ?
Giving a reason.

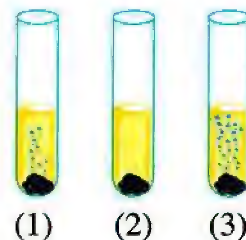
(b) Write the equation of the reaction showing oxidizing agent, reducing agent, oxidation and reduction processes.



Thinking Skills Questions

1. Choose the correct answer :

1. In front of you, a student added equal volumes of dil. hydrochloric acid to equal masses of 3 different metals. Which of the following choices express the arrangement of the 3 elements as shown in the opposite figure ?
   a. Iron - Magnesium - Silver.
   b. Iron - Silver - Magnesium.
   c. Magnesium - Silver - Iron.
   d. Magnesium - Iron - Silver.



2. The change number .... represents reduction process.
   a. $Zn \longrightarrow Zn^{++}$
   b. $2Br^{-} \longrightarrow Br_2$
   c. $Cu^{++} \longrightarrow Cu$
   d. $2O^{--} \longrightarrow O_2$
3. In the opposite reaction : $Cr^{+3} + Al \longrightarrow Cr + Al^{+3}$, ...
   a. electrons transfer from $Al \longrightarrow Cr^{+3}$
   b. protons transfer from $Al \longrightarrow Cr^{+3}$
   c. electrons transfer from $Cr^{+3} \longrightarrow Al$
   d. protons transfer from $Cr^{+3} \longrightarrow Al$
4. When we put an acid in a test tube containing caustic soda, ...
   a. only ionic compound is produced.
   b. only covalent compound is produced.
   c. both ionic and covalent compounds are produced.
   d. no reaction occurs.

2. Give a reason for :

1. An ionic compound is produced when a metal element reacts with non-metal element.
2. When you stir 5 grams of table salt in 10 ml of tap water, the following reaction doesn't occur : $NaCl + H_2O \longrightarrow NaOH + HCl$

3. Form a chemical activity series from the following default symbols Z, Q, B, A by using the following reactions :

* $A + ZX \longrightarrow AX + Z$

* $B + ZX \longrightarrow$ no reaction

* $Q + AX \longrightarrow QX + A$

4. In the opposite activity , a ppt. was formed only in tube no. (3). Element (X) is ....
(Give a reason for your answer).

5. How can obtain the following (by chemical equation only) ?

1. A transtional metallic element from copper hydroxide solution.
2. Table salt from sodium.
3. Copper from copper sulphate solution by two different methods.

6. In the following reaction :

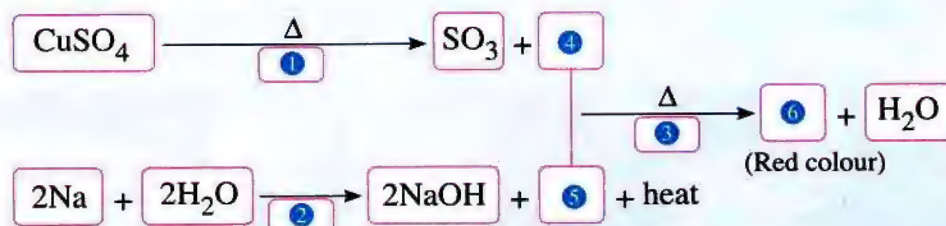
$2Fe^{+3} + Zn \longrightarrow 2Fe^{+2} + Zn^{+2}$

Which of the following statements are correct ? ....

1. Fe^{+3} reduced to Fe^{+2}
2. Zn oxidizes Fe^{+3}
3. Fe^{+3} act as an oxidizing agent.

a. (1) , (2) only.
b. (2) , (3) only.
c. (1) , (3) only.
d. (1) , (2) and (3).

7. Study the chemical reactions in the following diagram, then answer the following questions : *(Damietta 2017)*



(a) Write the chemical formula for 4 , 5 & 6. *(Ismailia 2019)*

(b) Mention the type of chemical reactions 1 , 2 & 3.

LESSON 2 Speed (rate) of Chemical Reactions

What are the factors affecting the speed of chemical reactions?

You know from the previous lesson that the chemical reaction is a process that includes changing of chemical substances (reactants) to another ones (products).

Chemical reactions differ in the speed of their occurrence, where there are :

1 Very fast reactions

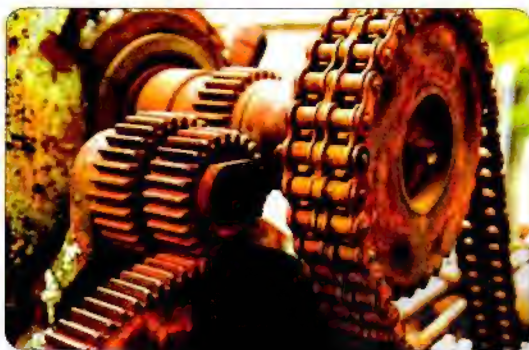
- They occur in very short time.
- **Ex.:** Fireworks.

2 Relatively slow reactions

- They occur in short time.
- **Ex.:** The reaction of oil with caustic soda (NaOH) to form soap.

3 Very slow reactions

- They need several months to occur.
- **Ex.:** Rusting of iron.



4 Too slow reactions

- They need millions of years to occur.
- **Ex.:** Reaction of petroleum oil formation inside the Earth.

Exercise 1

Complete :

1. Some reactions are very slow and need several months to take place, such as ....

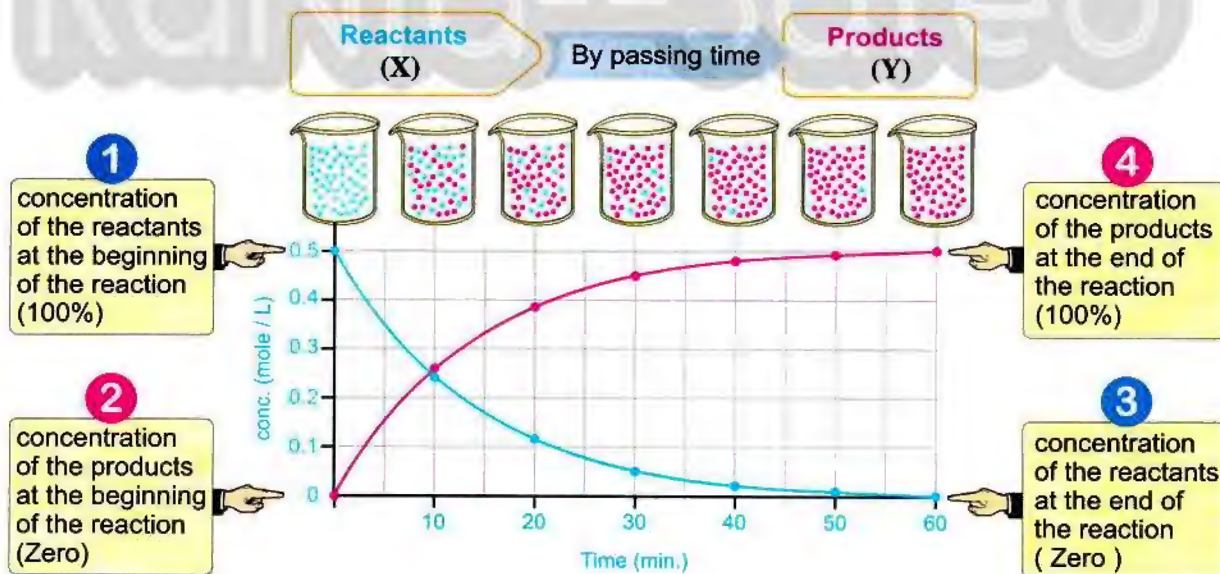
2. Iron rust is a .... chemical reaction, while firework is a .... chemical reaction.

Answer

1. iron rust.
2. very slow – very fast.

The concept of the speed of the chemical reaction

- **The following graph represents the speed of a chemical reaction :**



The measuring unit of concentration of the substance is mole/liter

From the previous figure, we conclude that

	1	2
At the beginning of the reaction	The concentration of the reactants (X) is the **largest** (100 %)	The concentration of the products (Y) is the **smallest** (zero %)
By passing time	The concentration of the reactants **decreases**.	The concentration of the products **increases**.
At the end of the reaction	3 The concentration of the reactants becomes the **smallest** (zero %).	4 The concentration of the products becomes the **largest** (100 %).

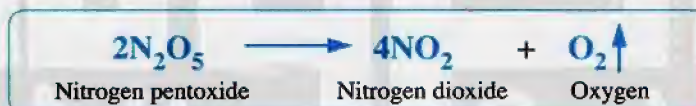
○ **From the previous explanation, we can define the speed of chemical reaction as follows :**

The speed of chemical reaction

It is the change in the concentration of the reactants and the resultants at a unit time.

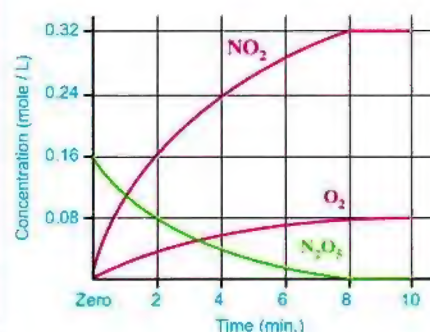
Application **The speed of decomposition (dissociation) of nitrogen pentoxide (N_2O_5)**

- Nitrogen pentoxide decomposes (breaks up) into nitrogen dioxide and oxygen gas :



- The following table and graph represent the results of this reaction practically.

Time (minutes)	The concentration of the reactants (mole/liter) N_2O_5	The concentration of the products (mole/liter) NO_2	O_2
0	0.16 (100 %)	Zero	Zero
2	0.08	0.16	0.04
4	0.04	0.24	0.06
8	Zero	0.32 (100 %)	0.08 (100 %)
10	Zero	0.32 (100 %)	0.08 (100 %)



From the previous table and graph, we conclude that

At the beginning of the reaction :	The concentration of the reactants (N_2O_5) is the **largest** (100%)	The concentration of the products (NO_2 , O_2) is the **smallest** (zero %)
By passing time :	The concentration of the reactants **decreases**.	The concentration of the products **increases**.
At the end of the reaction :	The concentration of the reactants becomes **the smallest** (zero %)	The concentration of the products becomes **the largest** (100 %)

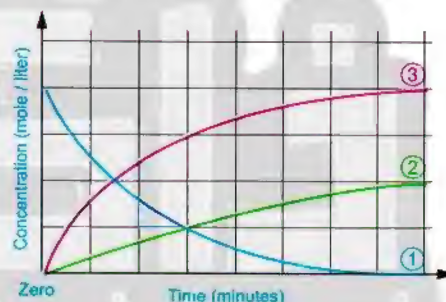
NB The end time of the reaction is evidenced by the constancy of concentration of both the reactants and the products by passing time.

Exercise 2

The opposite graph represents the breaking up of the compound X as in the following equation :

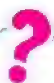
$$2X \longrightarrow 2Y + Z$$

- ***Replace the numbers shown on the figure with the suitable substances X , Y , Z***
(Give reason for your answer).



Answer

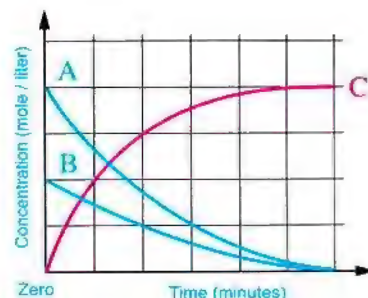
Number	The substance	Reason
①	X	Because it represents the reactant substance, where its concentration at : • The beginning of the reaction is 100% • The end of the reaction is zero.
②	Z	Because they represent the resultants, where their concentration : • At the beginning of the reaction is zero. • At the end of the reaction is 100% ∵ The number of moles of substance (Y > Z) as shown in the equation. ∴ The concentration of Y substance greater than that of Z on the graph.
③	Y	



Exercise 3

The opposite graph represents the relation (concentration - time) for a certain reaction.

Write the symbolic equation for this reaction :



Idea of answer

∵ **At the beginning of the reaction (at zero time) :**

* The concentration of the two substances A & B is the largest.
  ∴ The two substances A & B represent the reactants.
* ∵ The concentration of substance A is double the concentration of substance B. "at the beginning of the reaction".
  ∴ The reactants are written as follows : 2A + B

and

* The concentration of the substance C is the smallest.
  ∴ The substance C represents the products.
* ∵ The concentration of the substance C "at the end of the reaction" = The concentration of the substance A "at the beginning of the reaction".
  ∴ The products are written as follows : 2C

∴ The equation of the reaction :

$$2A + B \longrightarrow 2C$$

Answer

$$2A + B \longrightarrow 2C$$

Measuring the speed of the chemical reaction

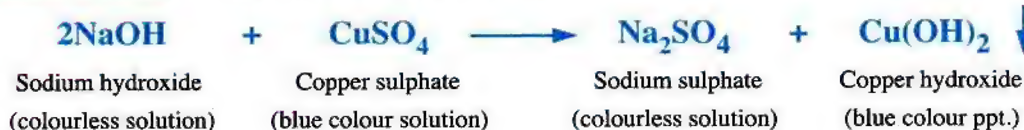
The speed of a chemical reaction can be measured practically by the rate of :

- Disappearance of one of the reactants.

Or

- Appearance of one of the resultants.

Application **The rate of reaction of sodium hydroxide solution with copper sulphate solution.**



$$2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2 \downarrow$$

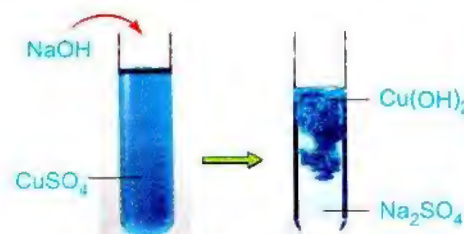
$2NaOH$	$CuSO_4$	Na_2SO_4	$Cu(OH)_2 \downarrow$
Sodium hydroxide (colourless solution)	Copper sulphate (blue colour solution)	Sodium sulphate (colourless solution)	Copper hydroxide (blue colour ppt.)

- **The speed in the previous reaction is measured practically by :**

* The disappearance rate of the blue colour of copper sulphate solution (reactant).

Or

* The formation rate of the blue colour precipitate of copper hydroxide (resultant).



Changing the blue copper sulphate solution into blue ppt. of copper hydroxide.

Factors affecting the speed of chemical reaction

Factors affecting the speed of chemical reaction

1. The nature of the reactants
2. The concentration of the reactants
3. The temperature of the reaction
4. Catalysts

1 The nature of the reactants

The effect of the nature of the reactants depends on two factors which are :

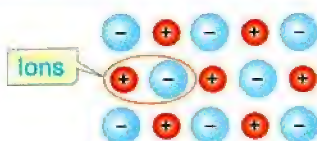
A. The kind of bonding in reactants.

B. The surface area of reactants exposed to reaction.

A The kind of bonding in reactants

The kind of bonding (ionic or covalent) in the molecules of reactants affects the speed of chemical reaction as in the following :

I Ionic compounds

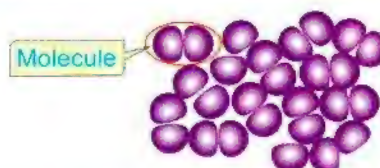


Ions of ionic compound

The reactions of ionic compounds are **fast**. G.R.

Because they take place between ions, where they break up (dissociate) completely into ions on dissolving in water.

II Covalent compounds



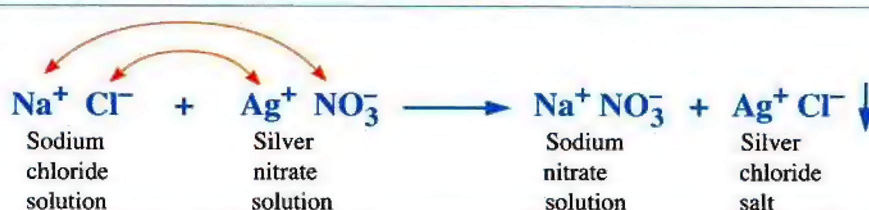
Molecules of covalent compound

Most of the reactions of covalent compounds are **slow**. G.R.

Because they take place between molecules, where they are difficult to ionize on dissolving in water.

G.R. ***The reaction between sodium chloride solution and silver nitrate solution is from fast reactions.***

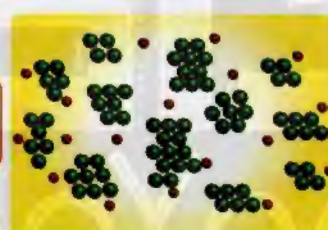
Because it takes place between ions that are resulted from dissociation of each of them in water.



B The surface area of reactants exposed to reaction

* The surface area of the reactants exposed to reaction affects the speed of the chemical reaction as in the following :

The reaction of substance (A) with substance (B)

When the reactant substance (B) is as a big-sized piece	When the reactant substance (B) decomposes to become as powder or filings or turning
	
The molecules of substance (A) react with the molecules of the outer surface only of the substance (B) and don't react with the molecules inside the bulk.	The molecules of substance (A) react with the molecules of the outer surface of the substance (B) and also with the molecules inside the bulk.
So,	
The reaction is slow.	The reaction is fast.
Because	
The surface area exposed to reaction is small.	The surface area exposed to reaction is large.

● Molecules of substance (A)
● Molecules of substance (B)

From the previous explanation, we conclude that :

As the surface area of the reactants exposed to reaction increases, the speed of chemical reaction increases.

Activity 1 The effect of surface area on the speed of the chemical reaction :

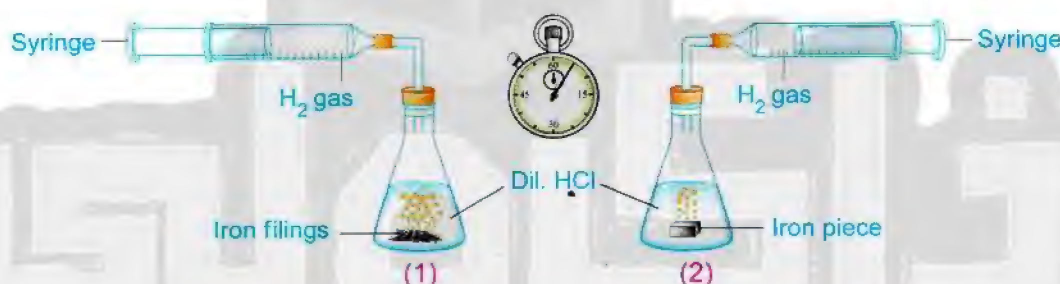
Tools:

- Two flasks.
- Two syringes.
- Two equal amounts of dilute HCl acid.
- Two equal masses of iron filings and iron piece.

The speed (rate) of this reaction is measured by the time required to complete the reaction, which evidenced by the constancy of concentration of the formed gas in the syringe.

Procedures:

1. Put the iron filings in flask (1) and the iron piece in flask (2).
2. Add two equal amounts of dil. HCl acid in both flasks.
3. Compare between the speed of the reaction in the two cases by noticing the out movement of the two syringes.



Observation:

The rate of reaction of hydrochloric acid with iron filings is faster than that in case of a piece of iron.

Explanation :

The surface area of iron filings exposed to reaction with the acid is **more than** the surface area of the iron piece, so the reaction in case of iron filings ends in a **short time** than that in case of iron piece.

Conclusion:

The speed of chemical reaction increases by increasing the surface area of the reactants exposed to reaction.

G.R.

- ***The speed of chemical reaction increases by increasing the surface area of the reactants exposed to reaction.***
  Due to increasing the number of molecules of reactants exposed to reaction.
- ***Using nickel filings in hydrating oil instead of pieces of nickel.***
  Because the speed of chemical reaction increases by increasing the surface area exposed to reaction.

TRY to answer worksheet **3** in the Notebook

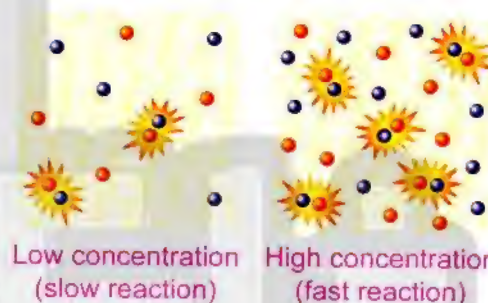
2 The concentration of the reactants

You may have noticed that :

The probability of collisions between persons in crowded street is bigger than that in a quiet street.

Similarly,

When the concentration (no. of molecules) of the reactants increases, the number of probable collisions between molecules increases, thus the speed of chemical reaction increases.



Activity 2 The effect of reactants concentration on the speed of the chemical reaction :

Tools:

- Two flasks.
- Two syringes.
- Two pieces of magnesium ribbon have the same size.
- Two equal amounts of HCl acid, one of them is diluted and the other is concentrated.

Procedures:

1. Put a piece of magnesium ribbon in each flask.
2. Add a small amount of dil. HCl acid in flask (1) and the same amount of conc. HCl acid in flask (2) by using a pipette.

The speed (rate) of this reaction is measured by the amount of the evolved gas through a certain period of time.

3. Compare between the amount of the evolved bubbles after a certain period of time by noticing the amount of the gas formed in both syringes.

Observations:

1. The amount of the evolved bubbles in case of using conc. hydrochloric acid is more than that in case of dil. hydrochloric acid.
2. The rate of the reaction of magnesium ribbon with conc. hydrochloric acid is faster than that in case of dil. hydrochloric acid.

Explanation:

The number of molecules of acid in concentrated solution is more than that in its diluted solution, which leads to increasing the number of probable collisions between reactant molecules, so the speed of chemical reaction increases.

Conclusion:

The speed of chemical reaction increases by increasing the concentration of the reactants.

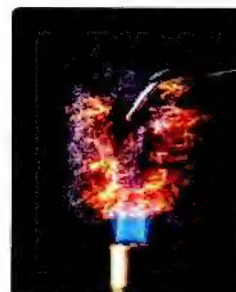
G.R.

- ***The speed of chemical reaction increases by increasing the concentration of the reactants.***

  Because by increasing the number of reactant molecules, the number of probable collisions between them increases.

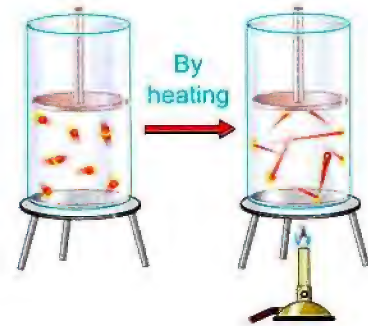
- ***Combustion of the steel scourers used for cleaning aluminium pots in a jar filled with pure oxygen is faster than its combustion in atmospheric air.***

  Due to increasing the speed of chemical reaction by increasing the concentration of oxygen gas.



Burning steel scourers in :
atmospheric oxygen (low O_2 concentration) — pure oxygen (high O_2 concentration)

3 The temperature of the reaction



* On increasing the temperature of the reactants, the speed of the reactants molecules increases, so the number of probable collisions between them increases, so the speed of the chemical reaction increases.

Activity 3 The effect of temperature on the speed of the chemical reaction :

Tools:

- Two effervescent tablets.
- Two similar glass beakers.
- Two equal amounts of water, one of them is hot and the other is cold.

Procedures:

1. Put one of the effervescent tablets in hot water and the other in cold water.
2. Compare between them in terms of the speed of occurrence of effervescence.

Hot water

Cold water

Observation:

The effervescence happens in case of hot water is faster than that in case of cold water.

Explanation :

The speed of the reactant molecules in case of hot water is greater than that its speed in case of cold water, which leads to increasing the number of probable collisions between molecules, so the speed of the chemical reaction increases.

Conclusion:

The speed of chemical reaction increases by increasing the temperature of the reaction.

G.R.

- ***The speed of chemical reaction increases by raising the temperature.***
  Due to increase in the number of probable collisions between reactant molecules.
- ***The fridge is used to preserve food.***
  Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which cause the rot of food.

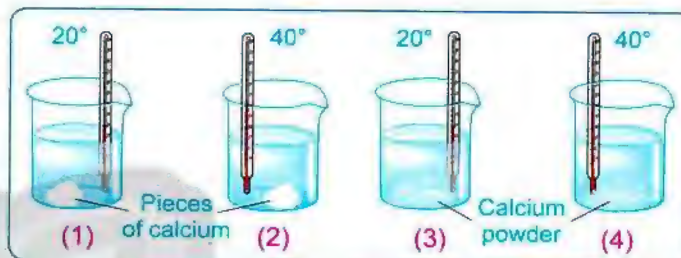
* ***If you want to cook food faster, you have to increase its temperature.***

 Because the speed of reactions of cooking food increases by raising the temperature.

Exercise 4

Answer the following question :

The opposite figures show the reaction of equal masses of calcium with equal amounts of water in different conditions. In which case, the reaction is faster ? Why ?



Answer

The figure (4), because the rate of chemical reaction increases by increasing the surface area of the reactants and the temperature.

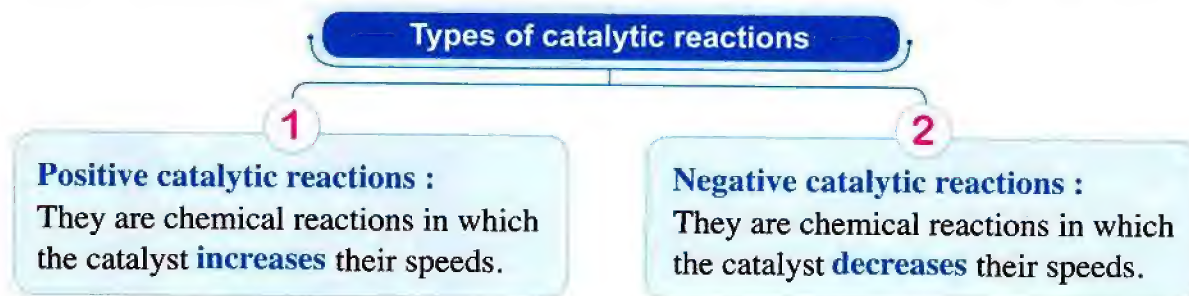
4 Catalysts

* To increase or decrease the speed of the chemical reactions, it is necessary to add certain chemical substances to them that don't affect the nature of the products, these chemical substances are known as catalysts.

A catalyst

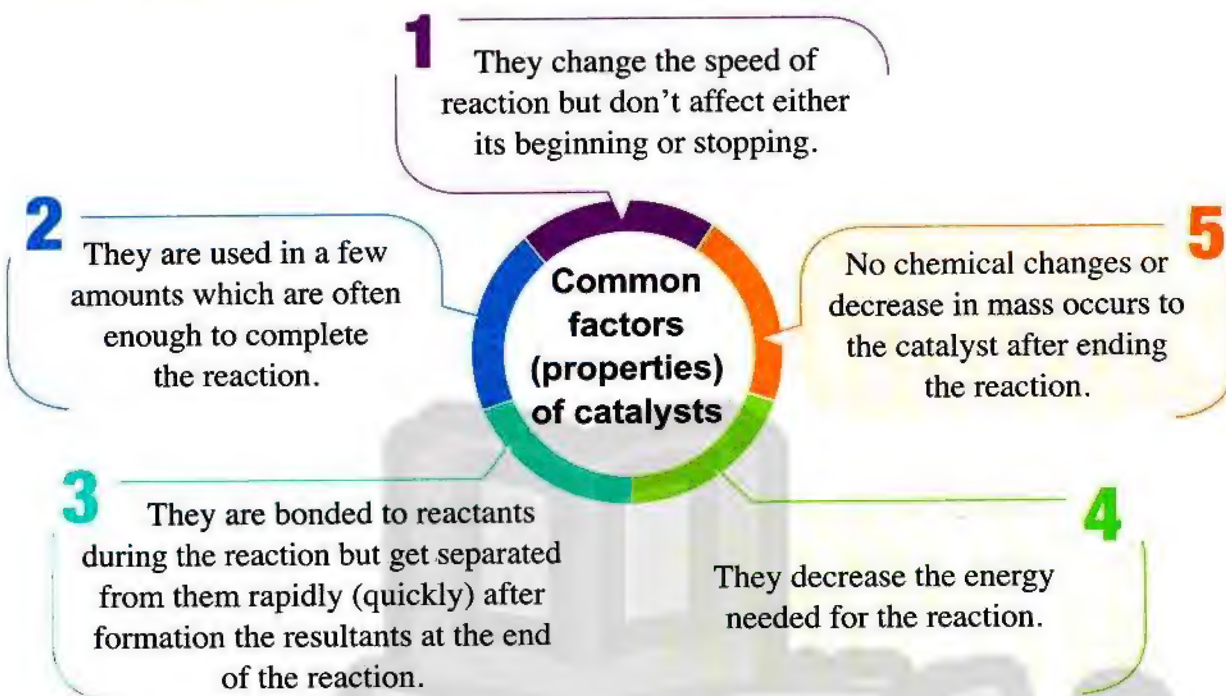
It is a chemical substance which changes the rate of the chemical reaction without changing or being used up.

* Chemical reactions in which catalysts are used are known as catalytic reactions, which are divided into two types according to the role of the catalyst as in the following diagram :



NB Most catalysts speed up the chemical reaction. i.e. Positive catalysts.

Common factors (properties) of catalysts



The following activity shows the effect of manganese dioxide as a catalyst on the speed of decomposition of hydrogen peroxide.

Activity 4 The effect of the catalyst on the speed of the chemical reaction :

Tools:

- A glass beaker.
- An amount of hydrogen peroxide (H_2O_2).
- Manganese dioxide powder (MnO_2) [catalyst].

Procedures:

1. Put hydrogen peroxide in the glass beaker, then add a small amount of manganese dioxide powder to it.
2. Compare between the amount of the evolved bubbles before and after adding manganese dioxide.

Observation:

Increasing the amount of the evolved bubbles on adding manganese dioxide powder to hydrogen peroxide.

Adding manganese dioxide powder to hydrogen peroxide

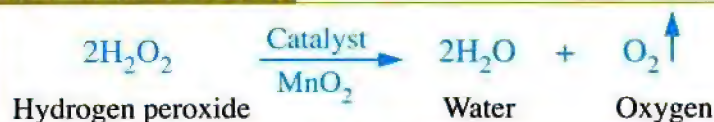
Explanation:

Manganese dioxide is a catalyst that **increases** the speed of decomposition of hydrogen peroxide into water and oxygen gas which evolves as bubbles.

Conclusion:

The speed of the chemical reaction increases by adding a catalyst.

For illustration only



$$2H_2O_2 \xrightarrow[MnO_2]{Catalyst} 2H_2O + O_2\uparrow$$

Hydrogen peroxide — Water — Oxygen

Enzymes

- The human body contains many types of chemical substances which act as catalysts in the laboratory known as Enzymes.

Enzymes

They are chemical substances produced by the body of a living organism, act as catalysts that increase the speed of biological reactions.

- The biological reactions occur in the presence of enzymes are more rapid than that without the enzymes, by thousands or even by millions times.
- Each enzyme has a specific function, a molecule of one enzyme can do its function million times per one minute.
- Without enzymes, man can never breathe, move or even digest food.

The following activity shows the effect of oxidase enzyme which exists in sweet potato on the speed of decomposition of hydrogen peroxide.

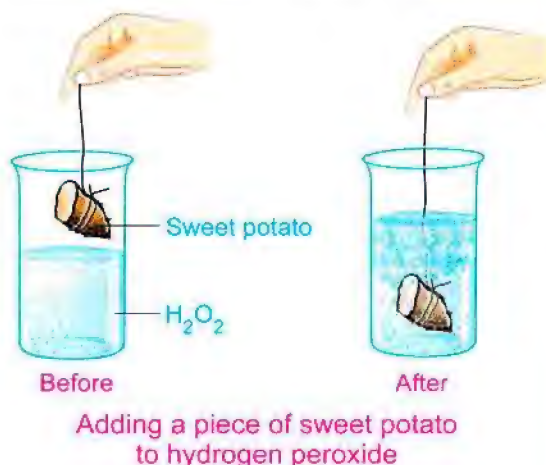
Activity 5 The effect of enzymes on the speed of the chemical reaction :

Tools:

- A glass beaker.
- A piece of sweet potato.
- An amount of hydrogen peroxide (H_2O_2).

Procedures:

1. Put an amount of hydrogen peroxide in a glass beaker, then add the piece of sweet potato to it.
2. Compare between the amount of the evolved bubbles before and after adding a piece of sweet potato.



Adding a piece of sweet potato to hydrogen peroxide

Observation:

Increasing the number of the evolved bubbles on adding a piece of sweet potato to hydrogen peroxide.

Explanation:

Oxidase enzyme in sweet potato acts as a catalyst which increases the rate of decomposition of H_2O_2 into water and oxygen.

Conclusion:

The speed of the chemical reaction increases by adding an enzyme.

Science, Technology and Society

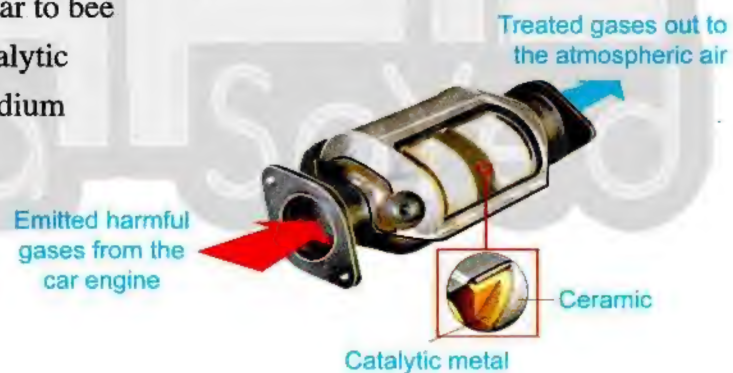
Catalytic converter

Catalytic converter

It is a metallic can that exists in most modern cars to treat the harmful gases emitted from the engine.

- **Structure :**

It is composed of ceramic cells (similar to bee cells) covered with thin layer of a catalytic metal as platinum, or palladium or iridium (expensive metals).



- **Importance :**

It helps in the treatment of harmful gases emitted from the car engine.

- **Idea of operation :**

① Ceramic cells are similar to bee cells which increase the surface area of the catalytic substance exposed to the current of the emitted gases from the engine so as to economize the use of expensive metals.

② The catalysts increase the speed of reactions of the treatment of the harmful gases emitted from the engine.

Science, Technology and Society

Usage of sodium bicarbonate in our life

A

In the home :

1. Put a small amount of sodium bicarbonate in the vacuum cleaner bag **G.R.**
   To get rid of the smell of dust that appears during cleaning.
2. Put a small amount of sodium bicarbonate in the bottom of the waste basket before putting the bag **G.R.**
   To prevent the bad odours.
3. Put a small amount of sodium bicarbonate in the kitchen's sink and pour on it boiling water **G.R.** To make the draining of the sink becomes faster.
4. Soak the legumes in water and add a small amount of sodium bicarbonate **G.R.**
   To help in decreasing the bloating that accompanies eating of legumes.

B

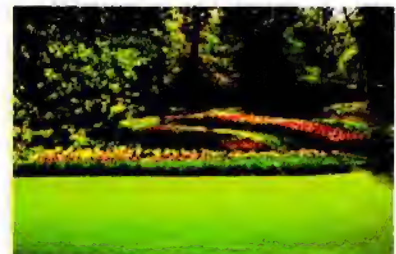
In polishing metals :

1. Put the silver tools in a bowl covered with aluminium foil, then cover them with boiling water added to it sodium bicarbonate, then dried them after rinsing with water to return to its luster.
2. Rub any decorative metal pieces made of copper or chrome with a piece of cloth wet with water and immersed in sodium bicarbonate.

C

In the garden :

Put sodium bicarbonate (without any additives) in the places where ants come out, and by passing time you notice their disappearance



TRY To answer worksheet

- General Exercise of the School Book on Unit 1
- Model Exams on Unit 1

in the Notebook

4

Remember

Lesson Two

Speed of the chemical reaction :

It is the change in the concentration of the reactants and the resultants in a unit time.

- At the beginning of any chemical reaction, the concentration of reactants is 100%, while the concentration of products is 0%
- At the end of any chemical reaction, the concentration of reactants is 0%, while the concentration of products is 100%

Factors affecting the speed of the chemical reactions are :

1. The nature of the reactants.

- Ionic compounds are fast reacting compounds, while covalent compounds are slow reacting compounds.
- As the surface area of reactants exposed to reaction increases, the speed of the chemical reaction increases and vice versa.

2. The concentration of the reactants.

As the concentration of reactants increases, the speed of the chemical reaction increases and vice versa.

3. The temperature of the reaction.

The speed of the chemical reaction increases by increasing the temperature of the reaction.

4. A catalyst.

It is a chemical substance which changes the rate of the chemical reaction without changing or being used up.

There are two types of catalystic reactions :

(a) Positive catalytic reactions : They are chemical reactions in which the catalyst increases their speeds.

(b) Negative catalytic reactions : They are chemical reactions in which the catalyst decreases their speeds.

Properties of catalysts :

1. They change the speed of reaction but don't affect either its beginning or stopping.
2. They are used in a few amounts which are often enough to complete the reaction.
3. They are bonded to reactants during the reaction but get separated from them rapidly after formation the resultants at the end of the reaction.
4. They decrease the energy needed for the reaction.
5. No chemical changes or a decrease in mass occurs to the catalyst after ending the reaction.

Enzymes :

They are chemical substances produced by the body of living organism, act as catalysts that increase the speed of biological reactions.

Questions ? on lesson Two

Interactive Exercises

• Remember • Understand • Apply • Higher skills 📖 School book questions.

1. Choose the correct answer :

1. The speed of the reaction of oil with caustic soda is .... *(Dakhalia 2017 / Qalyoubia 2019)*
   a. very fast. b. relatively fast. c. very slow. d. relatively slow.
2. The chemical formula of nitrogen pentoxide gas is .... *(Dakhalia 2019)*
   a. N_2O_5 b. $5NO_2$ c. N_5O_2 d. NO_2
3. The equation which represents the breaking up of nitrogen pentoxide is ....
   a. $NO_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2\uparrow$ b. $N_2O_3 \longrightarrow 2NO_2 + O_2\uparrow$
   c. $N_2O_5 \longrightarrow 2NO + \frac{1}{2}O_2\uparrow$ d. $2N_2O_5 \longrightarrow 4NO_2 + O_2\uparrow$
4. At the beginning (start) of the reaction, the percentage of the reactants concentration equals .... *(Cairo 2021 / Sohag 2019)*
   a. 100 % b. 0 % c. 50 % d. 25 %
5. At the beginning of the reaction, the concentration of the resultants is ....
   a. 0% b. 100% c. 75% d. 50%
6. By the end of the reaction, the concentration of the reactants is ....
   a. 0% b. 100% c. 50% d. 75%
   (Gharbia , Damietta 2021)
7. The speed of reaction of sodium hydroxide solution with copper sulphate solution is measured by the disappearance rate of the colour of ....
   a. copper hydroxide. b. sodium sulphate. c. copper sulphate. d. sodium hydroxide.
8. Factors that affect the rate of the reaction are .... *(Luxor 2015)*
   a. temperature of the reaction. b. concentration of reactants.
   c. nature of the reactants. d. all of the previous answers.
9. In the reaction : $H_2 + Cl_2 \longrightarrow 2HCl$ Which of these statements describe the rate of this chemical reaction ? .... by passing time.
   a. The concentration of H_2 & HCl increases
   b. The concentration of Cl_2 & H_2 increases
   c. The concentration of HCl increases
   d. The concentration of Cl_2 & HCl decreases
10. All of the following are factors affecting in the rate of chemical reaction expect ....
   a. the concentration of reactants. b. the nature of reactants.
   c. the nature of products. d. the temperature of the reaction.
   (Damietta 2017 / 2018 / 2019)

11. The nature of the reactants is related to ....
   a. kind of bonding in reactants.
   b. temperature of reactants.
   c. surface area of reactants.
   d. both (a) and (c) are correct.

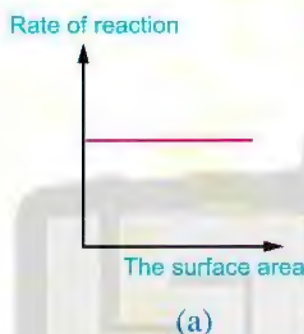
12. Covalent compounds are .... in their reactions. *(Sohag 2018)*
   a. fast
   b. slow
   c. very slow
   d. very fast

13. The chemical reaction of ionic compound is .... *(Aswan 2019)*
   a. slow.
   b. fast.
   c. between molecules.
   d. (a) & (c) together.

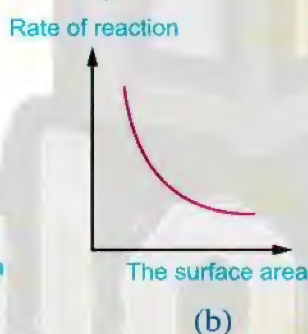
14. The reaction between silver nitrate solution and sodium chloride solution is .... reaction.
   a. fast
   b. slow
   c. very slow
   d. average

(Matrouh , South Sinai 2018)

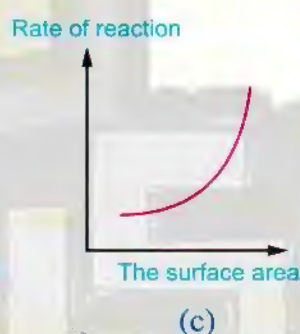
15. The .... figure represents the relation between the surface area exposed to the reaction and the rate of the reaction.



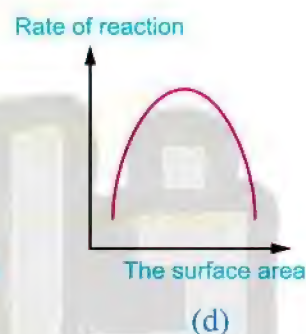
(a)



(b)



(c)



(d)

16. Iron filings react with diluted hydrochloric acid faster than a piece of iron that has the same mass due to the .... *(Sharkia 2021 / Sohag 2018)*
   a. increase in concentration.
   b. presence of a catalyst.
   c. increase in surface area.
   d. increase in temperature.

17. The rate of most of chemical reactions is .... by rising the temperature.
   a. increased
   b. decreased
   c. not affected
   d. stopped

(Qena 2016 / Fayoum 2018)

18. The rate of chemical reaction is increased by rising temperature due to .... *(Ismailia 2021)*
   a. increasing the number of probable collisions between molecules.
   b. increasing the concentration of reactants.
   c. increasing the surface area exposed to the reaction.
   d. increasing the number of molecules.

19. The increase in the concentration of the reactants during chemical reaction, the .... in the number of collisions between molecules. *(Assiut 2019)*
   a. decreases
   b. increases
   c. equal
   d. disappearance

20. .... increase the number of probable collisions between molecules and consequently increase the speed of reactions. *(Behira 2018)*
a. Adding a catalyst
b. Increasing the reaction temperature
c. Increasing the reactants concentration
d. Both (b) and (c)

21. The substance which changes the rate of the reaction without itself being changed is known as .... *(Assiut 2018 / North Sinai 2019)*
a. oxidizing agent. b. active agent. c. catalyst. d. reducing agent.

22. Catalyst increases the rate of chemical reaction because it .... *(Gharbia 2012)*
a. decreases the energy needed for the reaction.
b. combines with reactants then separates away to give the products.
c. does not chemically change.
d. all the previous answers.

23. The rate of breaking up of hydrogen peroxide increases by the addition of ....
a. manganese oxide.
b. magnesium oxide.
c. copper oxide.
d. manganese dioxide.
(Giza 2015 / Fayoum 2018)

24. By adding manganese dioxide to hydrogen peroxide .... *(Alex. 2019)*
a. Manganese dioxide works as a catalyst and its mass decreases by the end of the reaction.
b. Manganese dioxide works as a catalyst and its structure doesn't change.
c. Hydrogen peroxide decomposes and hydrogen gas evolves.
d. Hydrogen peroxide doesn't change and its mass doesn't decrease.

25. .... enzyme in sweet potato increases the rate of breaking up of hydrogen peroxide.
a. Reductase b. Oxidase c. Lactase d. Aminase

26. Enzymes act as .... in most of the biological processes. *(Luxor 2019)*
a. oxidizing agent b. detergent agent c. reducing agent d. catalysts

27. Sweet potato includes oxidase enzyme which helps in decomposition of ....
a. hydrogen chloride.
b. sodium chloride.
c. hydrogen peroxide.
d. sodium carbonate. *(Fayoum 2019)*

28. The speed of chemical reactions inside the human body .... in the presence of enzymes. *(Qalyoubia 2014)*
a. increases b. decreases c. is not affected d. stops

29. The ceramic cells in the catalytic converter leads to ....
a. increasing the surface area exposed to the reaction.
b. increasing the concentration of the reactants.
c. increasing the temperature.
d. decreasing surface area.

30. Sodium bicarbonate is used in polishing silver by using a piece of .... during washing.
a. copper foil b. zinc foil c. aluminium foil d. chrome foil

2. Correct the underlined words :

1. The reactions which take place inside the Earth to form **iron rust** may take millions of years. *(Ismailia 2019)*
2. **The iron rust** is a fast chemical reaction. *(Fayoum 2019)*
3. Nitrogen pentoxide breaks up into nitrogen dioxide gas and **nitrogen** gas. *(Sharkia 2021 / Gharbia 2019)*
4. The change in the **volume** of the reactants and resultants at a unit time is known as the speed of chemical reaction. *(Beni Suef 2018)*
5. At the beginning of the reaction, the concentration of the reactants equals **zero %** *(Giza 2014 / Suez 2016)*
6. The reactions of ionic compounds are **slower** than that of covalent compounds. *(Cairo, Suez, Red Sea 2018 / Damietta 2019)*
7. The ionic compounds are fast in their reactions, because they decompose into **molecules** that easy share in the reaction. *(Sharkia , Behira 2021 / Gharbia 2019)*
8. Iron filings reacts with diluted hydrochloric acid faster than a piece of iron has the same mass due to the increase in the **concentration**. *(Alex. 2013 / Matrouh 2015)*
9. $Fe + 2HCl \xrightarrow{dil.} \mathbf{Fe_2Cl_3} + H_2\uparrow$ *(Sharkia 2021)*
10. The number of molecules of acid in concentrated solution **equals to** its number in diluted solution.
11. The increase in the concentration of the reactants increases the number of probable collisions between molecules so that, the speed of reaction **decreases**. *(South Sinai 2017)*
12. By using 3 gm of catalyst in an experiment, its mass after finish the reaction is **less than** 3 gm. *(Beni Suef 2019)*
13. In **positive catalytic** reactions, catalyst is used to slow down the chemical reaction. *(Ismailia 2021 / Matrouh 2019)*
14. Catalysts that increase the speed of chemical reaction are called **negative catalysts**. *(Ismailia 2014)*
15. The speed (rate) of chemical reaction increases by **decreasing** temperature. *(Sohag 2016 / Giza 2017 / Aswan 2018)*

3. Put (✓) or (✗) , then correct what is wrong :

1. During the reaction, the concentration of the reactants decreases gradually, while the concentration of products increases gradually. ( )
2. The speed of the reaction of sodium hydroxide solution with copper sulphate solution is measured practically by the rate of the appearance of the blue colour of copper sulphate. ( )
3. Diluted hydrochloric acid reacts with magnesium faster than concentrated acid. ( )

4. Reaction of iron filings (powder) with sulphuric acid (H_2SO_4) becomes slower than the reaction with a block of iron with the same acid. *(Qalyoubia 2018)* ( )
5. The increase in both the concentration of the reactants and the reaction temperature causes the increase in the number of probable collisions between molecules consequently the speed of the reaction increases. ( )
6. The chemical reactions done by bacteria in food are slown down by freezing. ( )
7. Hydrogen peroxide decomposes into water and hydrogen gas evolves. ( )
8. The decomposition rate of hydrogen peroxide increases by adding magnesium oxide. ( )
9. Oxidase enzyme found in sweet potato. ( )
10. The catalyst is a substance that increases the speed of chemical reaction, because it decreases the energy needed for the reaction. *(North Sinai 2013)* ( )

4. Write the scientific term of each of the following statements :

1. The change in the concentration of the reactants and resultants in a unit time. *(Qalyoubia , Gharbia 2021)*
2. The compounds which break up into ions during the chemical reactions.
3. A chemical substance which changes the rate of chemical reaction without being changed. *(Kafr El-Sheikh 2021 / Menia 2019)*
4. • A substance which increases the speed of the chemical reaction without interfering in it or being consumed. *(Cairo , Assiut 2021)*
   • The substance that accelerates the rate of reaction and does not participate in it. *(Sharkia 2016 / North Sinai 2017)*
5. A substance which slows down the speed of chemical reaction and doesn't change during the reaction. *(Giza 2021 / Kafr El-Sheikh 2018)*
6. The chemical reactions in which the catalyst increases their speeds.
7. The catalyst which is used to increase the rate of breaking up of hydrogen peroxide.
8. The chemical substances produced by the body of living organism act as catalysts that increase the biological reactions. *(Menia 2018 / Damietta 2019)*
9. The enzyme which is found in sweet potato and accelerates the decomposition rate of hydrogen peroxide. *(Red Sea 2018 / Sharkia 2019)*
10. The metallic can exists in most modern cars to treat the harmful gases emitted from the engine. *(El-Menia 2021 / Sharkia 2019)*

5. Complete the following sentences :

1. Some reactions are very slow and need several months to take place, such as .... *(Damietta 2021 / Gharbia , Fayoun 2018)*

2. Iron rust is a .... chemical reaction, while firework is a .... chemical reaction. (Sharkia 2018)
3. At the beginning of the reaction, the concentration of reactants is .... %. (Beni Suef 2019)
4. During the reaction, the concentration of reactants .... gradually, while the concentration of resultants .... gradually. (Behira 2018 / Fayoum 2019)
5. At the end of the reaction, the concentration of reactants is .... , while the concentration of products is .... (Assiut 2021 / North Sinai 2017)
6. The change in the concentration of reactants and resultants in a unit time is known as .... (Aswan 2019)
7. Nitrogen pentoxide breaks up into .... and .... gases. (Assiut 2018 / North Sinai 2019)
8. At the beginning of the following reaction : $2N_2O_5 \longrightarrow 4NO_2 + O_2\uparrow$
The ratio of N_2O_5 is .... , while the ratio of NO_2 is .... (Damietta 2012)
9. The speed of a chemical reaction can be measured practically by the rate of .... of reactants or the rate of .... of resultants.
10. In the reaction : $2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2$ the speed of this reaction can be measured practically by the disappearance rate of the .... colour of .... or the appearance rate of the .... of copper hydroxide.
11. From the factors that affect the chemical reaction are .... , ... , ... and .... (Luxor 2012)
12. The nature of the reactants is related to .... and .... (Menia 2016)
13. The reactions of the covalent compounds are ....
14. The reaction of ionic compounds are .... than that of the covalent compounds. (Gharbia 2016)
15. The reactions of the covalent compounds are slow because they take place between .... , while the reactions of ionic compounds are fast, because they take place between .... (Dakahlia 2016 / Behira 2019)
16. The speed of the reaction between diluted hydrochloric acid and a cube of iron is .... than that between iron filings with the same acid because the .... of iron filings is larger.
17. Sodium chloride powder reacts .... than a cube of sodium chloride of the same mass. (Fayoum 2016 / Beni Suef 2018)
18. The increase in concentration of reactants makes the rate of chemical reaction ....
19. The speed (rate) of chemical reactions .... due to the increase in temperature. (Giza 2015 / Sohag 2018)
20. A substance which increases the rate of the chemical reaction without sharing in the reaction is called .... (Aswan 2014 / Sohag 2016)
21. The catalyst change the speed of reaction, but don't affect either its .... or .... (Matrouh 2018)

22. Most catalysts speed up the chemical reaction and are called .... *(Beni Suef 2017)*
23. Catalytic reactions divide according to the role of the catalyst into .... reactions and .... reactions.
24. The rate of decomposing hydrogen peroxide increases by adding .... or a piece of .... *(Alex. 2018)*
25. .... enzyme in sweet potato acts as a .... to increase the rate of H_2O_2 decomposition. *(Luxor 2017 / Port Said 2019)*
26. The most modern cars are equipped with .... which helps in treatment of harmful gases emitted from the car engine. *(Behera 2016)*
27. In the catalytic converter, the ceramic cells covered with a thin layer of .... metal as .... or palladium.

6. Complete the following equations :

1. $2N_2O_5 \longrightarrow$ .... + $O_2\uparrow$ *(Sharkia, Menofia 2018)*
2. $2NaOH + CuSO_4 \longrightarrow$ .... + ...
3. $Na^+Cl^- + Ag^+$ .... $\longrightarrow Na^+NO_3^- +$ .... *(Dakahlia 2018)*
4. $Fe + 2HCl \xrightarrow{dil.}$ .... + ... *(Cairo 2021 / Sohag 2014)*
5. $Mg + 2HCl \longrightarrow$ .... + ...

7. Give reasons for :

1. The reaction between sodium chloride solution and silver nitrate solution is from fast reactions.
2. Reactions between ionic compounds are fast, whereas reactions between covalent compounds are slow. *(Dakahlia , Beni-Suef 2021)*
3. The speed of the chemical reaction increases by increasing the surface area of the reactants exposed to reaction.
4. • A certain mass of iron filings reacts with acids faster than the reaction of a piece of iron has the same mass with acids. *(Menia 2013 / New Valley 2017)*
   • The rate of the reaction of hydrochloric acid with iron filings is faster than a piece of iron has the same mass. *(Aswan 2018 / Suez 2019)*
5. Using nickel filings in hydrating oil instead of pieces of nickel. *(Luxor 2013)*
6. Burning of the steel scourers used for cleaning aluminium in a jar filled of pure oxygen is faster than its burning in atmospheric air. *(Matrouh 2018 / Gharbia 2019)*
7. The speed of chemical reaction increases as the concentration of the reactants increases. *(Red Sea 2018 / Sohag 2019)*

8. A magnesium ribbon reacts with concentrated hydrochloric acid faster than the diluted hydrochloric acid.
9. The rate (speed) of chemical reaction increases by increasing temperature. *(Cairo 2021 / Menia 2019)*
10. If you want to cook food faster, you have to increase its temperature. *(Behira 2015)*
11. • The fridge is used to preserve food. *(Alex. , Damietta 2021)*
    • Preservation of food in the freezer of the refrigerator. *(Menofia , Ismailia 2018)*
12. Catalysts are used in some chemical reactions. *(Menia 2014 / Behira 2017)*
13. Adding a few manganese dioxide powder to hydrogen peroxide increases the number of the evolved gas bubbles.
14. Adding a piece of sweet potato increases the decomposition of hydrogen peroxide. *(Menofia 2021 / Qalyoubia 2019)*

8. What happens when ...?

1. Breaking up of the reactants used in the chemical reaction.
2. The concentration of the reactants becomes zero. *(North Sinai 2019)*
3. Adding sodium hydroxide solution to blue copper sulphate solution (write the equation of the reaction). *(Sharkia 2018)*
4. Increasing the surface area exposed to reaction "related to the number of reacting molecules and the rate of the reaction". *(Assiut 2021)*
5. Replacing a piece of iron with iron filings has the same mass on reacting with an equal amount of diluted acids. *(Giza , Fayoum 2019)*
6. Replacing dilute hydrochloric acid by concentrated hydrochloric acid when reacting with magnesium. *(Giza 2018)*
7. Putting two effervescent tablets in two beakers, one of them contains cold water and the other contains hot water. *(Red Sea 2018)*
8. Increasing the temperature of the chemical reaction. *(Suez 2018)*
9. The temperature of the reaction is raised up related to the number of collisions. *(Qalyoubia 2018)*
10. You keep food outside the refrigerator for a long time. *(New Valley 2018)*
11. Increasing the concentration of the reactants. *(Fayoum 2021 / Suez 2019)*
12. Adding a negative catalyst to a rapid reaction. *(Sharkia 2017)*
13. • Adding few manganese dioxide (MnO_2) powder to hydrogen peroxide. *(Cairo , Damietta 2019)*
    • Putting a piece of sweet potato in a flask containing hydrogen peroxide. *(Luxor 2019)*

9. What is meant by...?

1. Rate (speed) of chemical reaction. *(Dakahlia 2021 / Sharkia 2018)*
2. A catalyst. *(Suez 2021 / Sohag 2019)*
3. Positive catalytic reactions.
4. Negative catalytic reactions.
5. Enzymes. *(South Sinai 2017 / Behira 2019)*

10. Show by balanced equations each of the following reactions :

1. Reaction of decomposition of nitrogen pentoxide. *(Alex. 2017)*
2. Reaction of sodium hydroxide solution with copper sulphate solution.
3. Reaction of iron with dil. hydrochloric acid.
4. Reaction of magnesium with dil. hydrochloric acid.

11. Mention one importance or use for the following :

1. Catalyst in chemical reaction. *(Suez 2017 / Suez, South Sinai 2018)*
2. Manganese dioxide. *(Ismailia 2015)*
3. Enzymes. *(South Sinai 2017)*
4. Oxidase enzyme. *(Gharbia 2021 / Sohag 2019)*
5. Catalytic converter in modern cars. *(Gharbia , Behira 2021)*

12. Compare between :

1. Covalent compounds and ionic compounds (according to the speed of chemical reaction). *(Cairo , Qena 2019)*
2. The reaction between dilute hydrochloric acid with two equal masses of iron filings and iron piece (according to : the speed of chemical reaction). *(Qalyoubia 2015)*
3. Positive catalytic reactions and negative catalytic reactions. *(Behira 2021 / Ismailia 2016)*

13. Illustrate by an experiment each of the following :

1. 📖 The effect of the surface area on the speed of chemical reaction. *(Behira, Dakahlia 2018)*
2. The effect of reactants concentration on the speed of chemical reaction.
3. 📖 The effect of temperature on the speed (rate) of chemical reaction. *(Port Said, Assiut 2018)*
4. • 📖 The importance of a catalyst on a chemical reaction.
   • The effect of a catalyst on breaking up of hydrogen peroxide. *(Damitta 2013)*
5. The effect of enzymes on the speed of chemical reaction. *(Menofia 2013)*

14. Mention each of the following :

1. Factors affecting the speed of a chemical reaction. *(Qalyoubia 2017 / Sharkia 2019)*
2. Factors affecting the nature of the reactants. *(Dakhalia 2017)*
3. Common factors of catalysts in chemical reactions. *(Behira 2018)*
4. The idea of operation of the catalytic converter.

15. Variant questions :

1. How can you differentiate between :

Sodium chloride solution and sodium hydroxide solution. (by two different methods).

2. Mention two ways to increase the speed of the following reaction :

A cube of iron + Hydrochloric acid $\xrightarrow{\text{dil.}}$ Ferrous chloride + Hydrogen gas. *(Damietta 2016)*

3. From the reaction : $2NaOH + CuSO_4 \longrightarrow$ Salt + Precipitate

(a) Mention the name and the symbol of the salt.

(b) Mention the name and the colour of the precipitate.

(c) How can you measure the speed of this reaction practically ?

(d) What happens to the precipitate if is heated strongly ? (write the equation of the reaction). *(Behira 2017)*

4. In the reaction : Zinc + Hydrochloric acid $\xrightarrow{\text{dil.}}$ Salt + Hydrogen gas

(a) Mention the name of the produced salt.

(b) Show the effect of each of the following factors on the rate of the reaction :

1. Cooling the reaction.
2. Adding a positive catalyst to the reaction.
3. Replacing the diluted hydrochloric acid with another concentrated.

5. A teacher wants to make a decomposition reaction of hydrogen peroxide quickly, so he added 3 gm of one of chemical substances :

(a) What is the name of the added chemical substance ?

(b) What is the type of catalytic reaction that this reaction belongs to ? Why ?

(c) Is the mass of the added substance change after ending the reaction ? Why ?

(d) How to increase the speed of this reaction by another way ?

6. You have two comical flasks–two syringes–two equal amounts of diluted hydrochloric acid–two equal masses of iron (one of them is iron filings and the other is one piece).

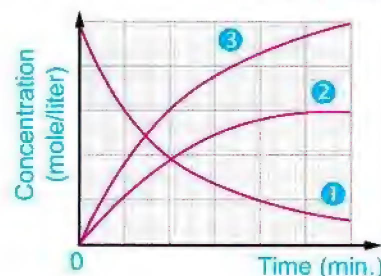
- By using the previous tools explain an activity to show the effect of surface area on the speed of a chemical reaction, with writing the equation of the reaction. *(Minia 2019)*

16. Study the graphs, then answer the questions :

1. **The following equation explains the decomposition of a compound :** *(Luxor 2019)*

$$2X \longrightarrow 2Y + Z$$

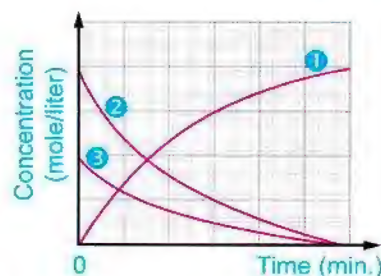
The opposite graph illustrates the change in concentration of reactants and resultants in respect to time.
Write the name of the compound or the element which each number indicates.



2. **The opposite equation represents the combination between two elements to form a compound :**

$$A + 2B \longrightarrow AB_2$$

The opposite graph represents the concentration of the reactants and resultants,
Answer the following :

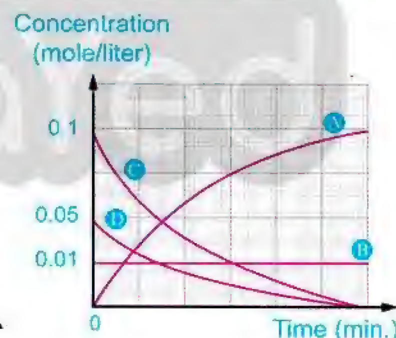


(a) Write the name of the compound or the element which each number indicates.
(b) What happens to the concentration of (AB_2) during the reaction?
(c) Mention in which time the concentration of :
1. Compound AB_2 is 100%
2. Element B is 100%
3. Element A is 0%
4. Compound AB_2 is 0%

3. **The opposite graph illustrates the change in concentration of reactants and resultants in respect to time. Answer the following questions :** *(Kafr El-Sheikh 2013)*

(a) Write the letter(s) which indicate(s) the following :
1. reactants.
2. resultants.
3. catalyst.

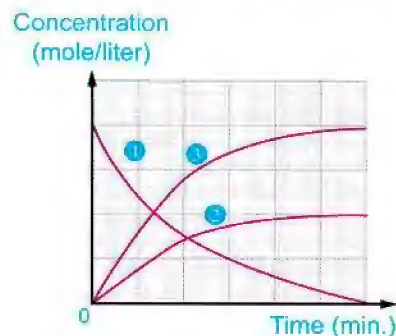
(b) Choose from the following equations the correct balanced equation that indicates this graph :
1. $A + 2D \xrightarrow{C} B$
2. $2D + C \xrightarrow{B} A$
3. $2C + B \xrightarrow{A} D$
4. $2C + D \xrightarrow{B} 2A$



4. **The opposite graph represents the rate of thermal decomposition of mercuric oxide according to the following equation :** *(Red Sea 2019)*

$$2HgO \xrightarrow{Heat} 2Hg + O_2\uparrow$$

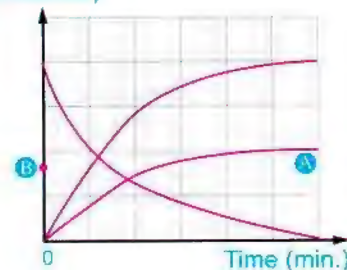
From the graph, write the name of the compound or the element which each number indicates & Give reasons.



5. The opposite graph illustrates the breaking up of SO_3 into SO_2 and O_2 as in the following equation : *(Matrouh 2012)*

$$2SO_3 \longrightarrow 2SO_2 + O_2$$

Draw this graph in your answer paper and then answer the following questions :

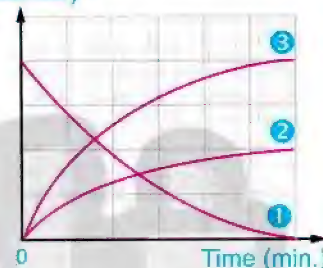


(a) By the end of the reaction, the concentration of SO_3 will be equal to .... mole/liter.

(b) The graphical line (A) demonstrates the concentration of ....

(c) If we add a catalyst to the previous reaction, draw a graphical line from (B) demonstrates this catalyst.

6. The opposite figure represents the rate of thermal decomposition of sodium nitrate :



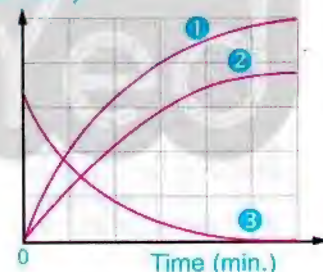
(a) Write the balanced symbolic equation of this reaction.

(b) Replace the numbers on the figure by suitable substances from the equation.

(Matrouh 2017 / Qalyoubia 2019)

7. The opposite graph represents the rate of rapid decomposition of the substance of sodium azid (which is present inside the air bag) : *(Behira 2017)*

$$2NaN_3 \xrightarrow{\text{Electric spark}} 2Na + \cdots\cdots\cdots$$



(a) Complete the equation.

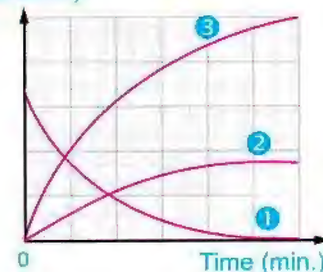
(b) From the graph, write the name of the compound or the element which each number indicates.

(c) Mention the importance of the air bag.

8. The following equation represents the decomposition of nitrogen pentoxide

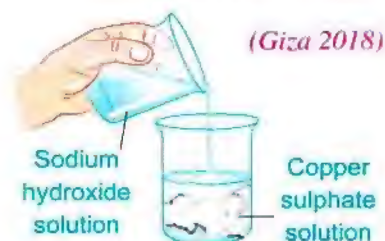
$$2N_2O_5 \longrightarrow 4NO_2 + O_2$$

The opposite graph illustrates the change in the concentration of reactants and resultants in respect to time. Write the name of the element or compound which each number refers. *(Kafr El Sheikh 2018 / Matrouh 2019)*



9. In the opposite figure : *(Giza 2018)*

How is the rate if this reaction measured ?



10. From the opposite figure : *(Menofia 2019)*

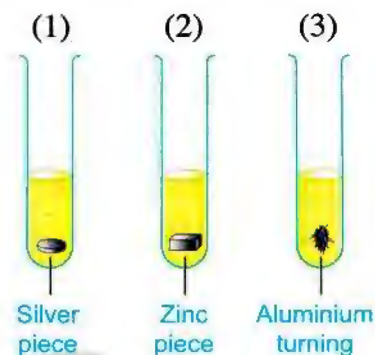
On adding equal amounts of diluted hydrochloric acid to the represented tubes (1, 2, 3) in the figure explain the following :

(a) Non-occurrence of reaction in tube (1).

(b) Delaying the beginning of the reaction in tube (3) than tube (2) although aluminium is more active than zinc.

(c) What happen to the rate of the reaction, when zinc piece in tube (2) replaced by small pieces or zinc powder, and why ?

(d) What is the name of gas evolves during reaction ?



11. From the opposite figure, read then answer the following : *(Alex. 2019)*

Three test tubes (A), (B) and (C) by adding equal volumes of diluted HCl to each of them :

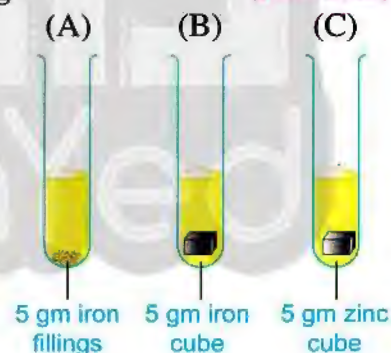
(a) Which of the following sequences express the speed of the chemical reactions :

1. A > B > C

2. C > B > A

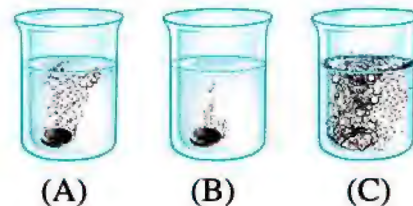
3. C > A > B

(b) Mention the reason of the right choice.

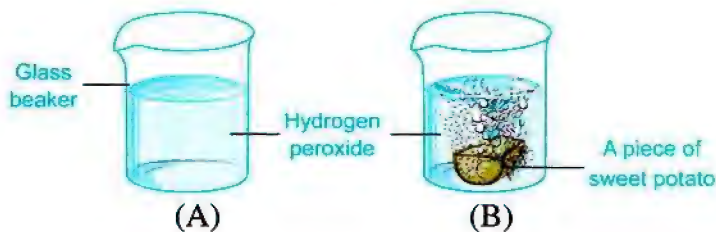


12. On adding three effervescence tablets in three glass beakers having equal amounts of water of different temperatures.

Arrange these glass beakers descendingly according to the temperature of water in each of them. Give a reason.



13. Study the following figures (A & B), then answer the questions : *(Behira 2016)*



(a) What is the name of the gas produced from decomposition of hydrogen peroxide ?

(b) How can you discover it ?

(c) Which of the two beakers (A or B) produce more gas bubbles ? Explain your answer.

14. From the opposite figure :

Explain how to measure the speed of the chemical reaction practically ? *(Ismailia 2019)*

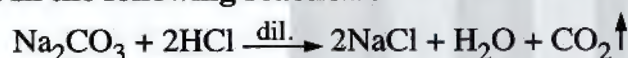
Thinking Skills Questions

1. Choose the correct answer :

1. On the reaction of 1gm of pieces of calcium carbonate with hydrochloric acid, its concentration is 1mole/liter a known volume of CO_2 gas evolves in 60 sec., on repeating the same experiment by using 1gm of pieces of calcium carbonate with hydrochloric acid, its concentration is 2 mole/liter, the same volume of the CO_2 gas evolves in .... sec.

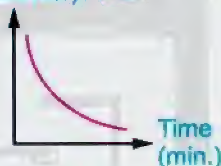
   a. 30 b. 60 c. 120

2. **In the following reaction :**

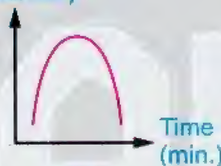


$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

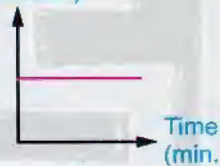
Figure number .... represents the change occurs in the concentration of hydrochloric acid by passing time.



(a)



(b)



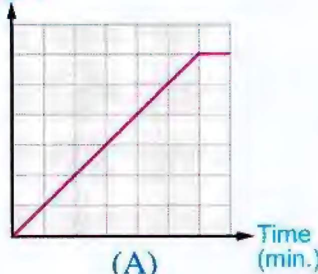
(c)

(d)

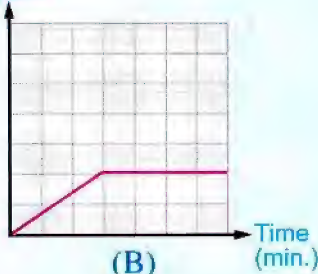
2. A student makes two experiments to prepare hydrogen gas :

- **In the first experiment :** He uses a piece of zinc, whose mass is 5 gm with abundance of hydrochloric acid.
- **In the second experiment :** He uses zinc powder, whose mass is 5 gm with abundance of the same acid with the same concentration at constant temperature during the two experiments.

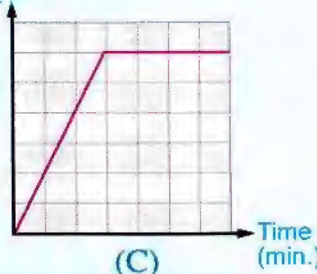
Choose for each experiment, the graph which represents it after 3 minutes of the reaction. Give reason for your answer.



(A)



(B)



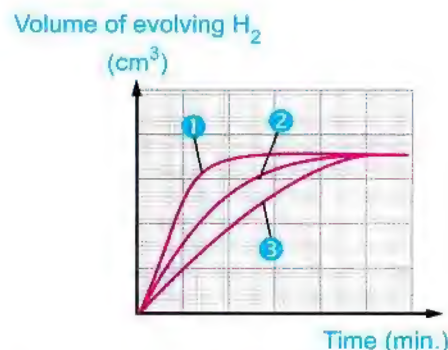
(C)

3. The opposite graph represents the effect of the surface area of iron exposed to the reaction, on the rate of the reaction with conc. hydrochloric acid :

(a) Which of the numbers shown on the figure represents the rate of this reaction when iron as :

1. A large piece.
2. Small pieces.
3. A powder.

(b) What should be considered during this activity to ensure that the surface area of reactants is the only factor that affects in this experiment ?



4. On an experiment, if we burn equal masses of steel scourers in two similar jars, one of them contains atmospheric air and the other containing a mixture of 5% oxygen in abundance of nitrogen.
In which jar the burning of steel scourers is faster, and why ?

Project
On UNIT ONE

A project to develop the mental organization
"Observing characteristics"

* Mention one Observation to explain each of the following :

1. Change of copper hydroxide to copper oxide by heating.

....

....

2. On strong heating of copper carbonate, carbon dioxide gas evolves.

....

....

3. Deducing the occurrence of a chemical reaction.

....

....

4. Production of nitrogen gas from sodium azid under the effect of electric spark.

....

....

5. The reaction of sodium with water is one of the heat producing reactions.

....

....

6. Magnesium substitutes copper in copper sulphate solution.

....

....

7. The reduction property of hydrogen gas.

....

....

8. The effect of surface area of reactants on the rate of the chemical reaction.

....

....

9. The effect of temperature on the rate of the chemical reaction.

....

....

10. The presence of oxidaze enzyme in sweet potato.

....

....

UNIT

2

Electric Energy and Radioactivity

Lesson **1** | Physical Properties of the Electric Current.
Lesson **2** | Electric Current and Cells.
Lesson **3** | Radioactivity and the Nuclear Energy.

Unit Objectives :

By the end of this unit, students will be able to :

- Identify the concepts of current intensity, potential difference and the electric resistance.
- Identify the instruments used for measuring the current intensity, the potential difference and the electric resistance.
- Identify the units for measuring the current intensity, the potential difference and electric resistance.
- Identify some of the sources of the electric current.
- Compare between the alternating current and the direct current.
- Compare between the methods of connecting the cells in electric circuits.
- Identify the phenomenon of radioactivity.
- List examples of radioactive elements.
- Identify the safe uses of the nuclear energy.
- Identify the harmful effects of radiation pollution and the method of protection.
- Appreciate the importance of electric energy in our life through its multiple applications.

LESSON 1

Physical properties of the Electric Current

What are the physical properties of electric current ?

We cannot imagine our life without electric current, as electricity plays an important role in our daily life, such as :

1. It is used to light up our houses, factories, streets, ... etc.

2. It is used in operating some machines, such as radios, televisions, washing machines, irons, electric heaters, ... etc.

NB The electric energy is the cleanest source of energy as it does not pollute the environment.

The Electric Circuit

* The electric circuit consists of many components, each one of these components do a certain role.

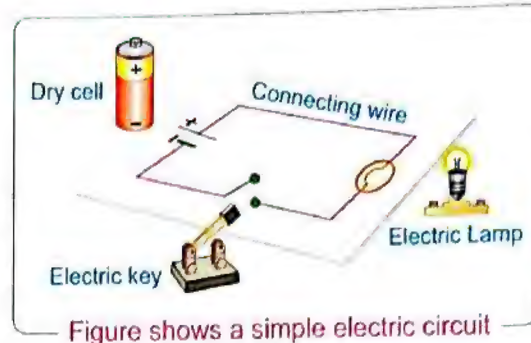


Figure shows a simple electric circuit

* **The following table shows the role and the symbol of each component in the electric circuit.**

Components (Tools)	Role (Function)	Shape	Symbol
Electric lamp	It indicates the flow of the electric current.		
Electric key	Opening and closing the circuit.	Opened key Closed key	
Connecting wire	Connecting the components of the electric circuit with each other.		
Electric cell	The source of the electric current.		− +
Electric battery			− +

Note

The two parallel lines in the electric circuit refer to the **dry cell** where,

- The **tallest** line represents the **positive pole**.
- The **smallest** line represents the **negative pole**.

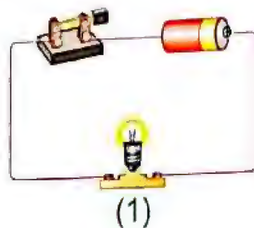
We will study laterlly other components of the electric circuit like :

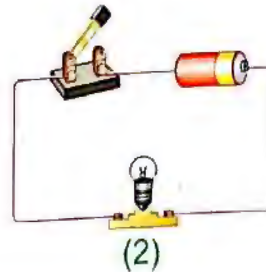
- **Ammeter.**
- **Voltmeter.**
- **Ohmmeter.**
- **Rheostat.**

Exercise 1

Solve the following :

In the following two circuits, why does the electric lamp illuminate in the circuit (1) and it does not illuminate in the circuit (2) ?


(1)


(2)

Answer

- The electric lamp illuminates in circuit (1) as all components of the circuit are connected with each other **(Closed circuit)**.
- The electric lamp doesn't illuminate in circuit (2) as the circuit is open.

Electric Current

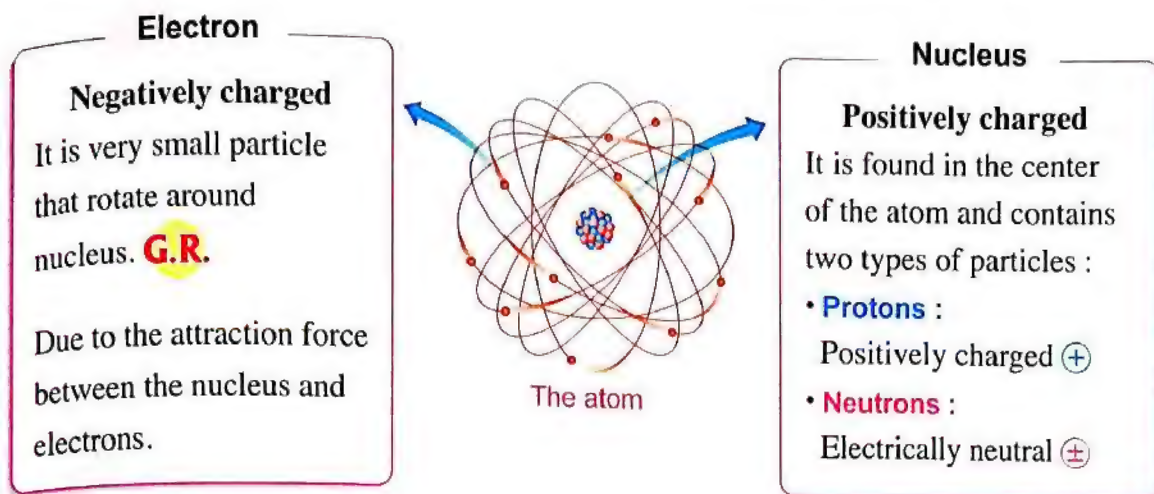
Have you ever thought where the electric current is generated ...?

- Electric current is generated in electric power stations that are away from our houses by hundreds or thousands of kilometers.

Connecting electric power from the main generators in the cities to the houses

How is the electric current generated ? What is meant by the electric current ...?

➲ You have studied previously that all elements consist of atoms which consist of :



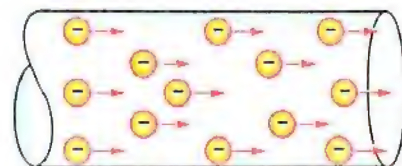
- When this attraction force is weak or vanished, electrons will leave the atom and become free.
- **Upon this idea, electric connecting wires are made up of metals characterized by the presence of weak attraction force between its protons and its electrons.** **G.R.**

Because on connecting these wires with an electric source, an electromotive force is generated and electrons are pumped and move in the wires (conductors) creating the electric current.

Therefore, the electric current is defined as :

The electric current :

It is the flow of electric negative charges (electrons) through a conducting material (as a metal wire).



The flow of free electrons through a cross-section of a conductor.

G.R.

- ***The atom is electrically neutral.***

  Because the number of protons (positively charged) in the nucleus equals the number of electrons (negatively charged) that rotate around the nucleus.

- ***The nucleus is positively charged.***

  Because it contains protons (positively charged) and neutral neutrons.

UNIT 2

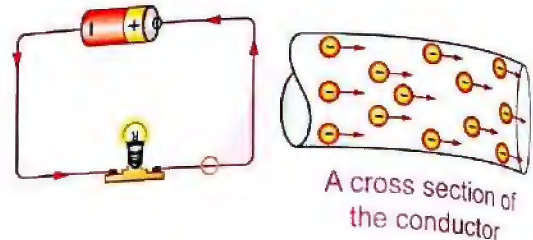
Physical properties of the electric current

1 Current intensity
2 Potential difference
3 Electric resistance

1 Current intensity

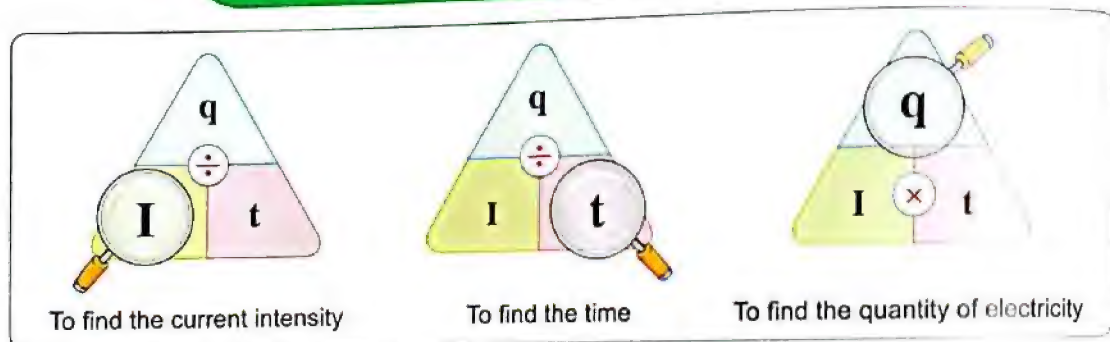
The electric current intensity :

It is the quantity of electricity in coulomb or the electric charges flowing through a cross-section of the conductor in one second.



- If a quantity of charge (q) coulomb flows through a conductor in a time (t) second, the electric current intensity (I) is given by :

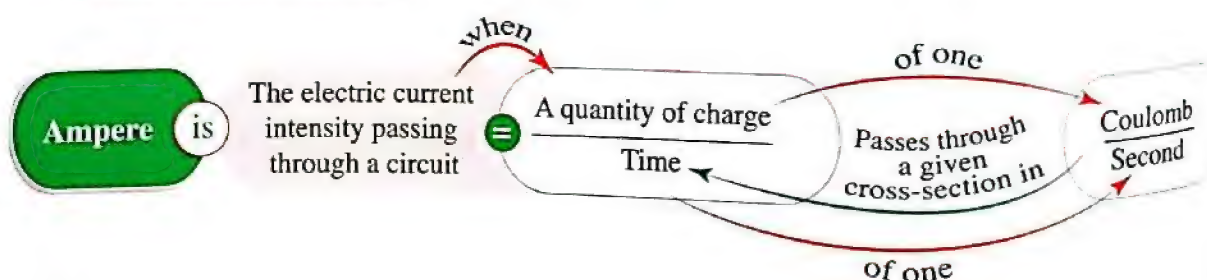
$$\text{Current intensity (I)} = \frac{\text{Quantity of charge (q)}}{\text{Time in seconds (t)}} \quad (1)$$



- The measuring unit of the ***current intensity*** (I) is the "Ampere".
- The measuring unit of the ***quantity of electricity (quantity of charge)*** (q) is the "Coulomb".
- The measuring unit of ***time*** (t) is the "Second".

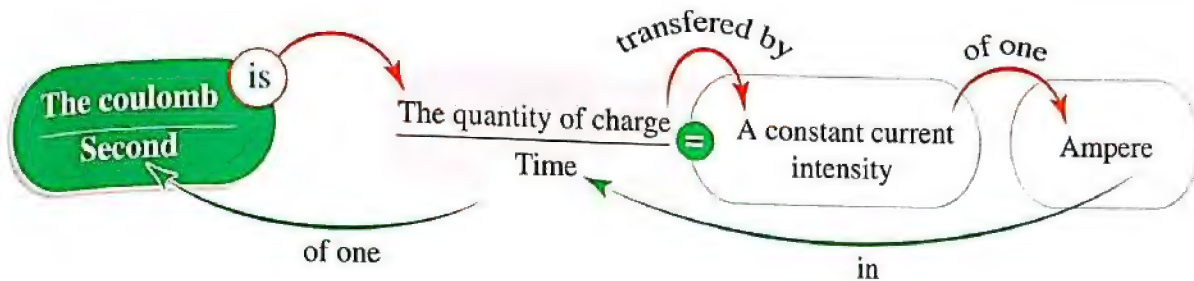
$$1 \text{ Ampere} = \frac{1 \text{ Coulomb}}{1 \text{ Second}} \quad (2)$$

From the previous two relations (1) and (2), we can define the ampere and the coulomb, as follows :



The ampere :

It is the electric current intensity passing through a circuit when a quantity of charge of one coulomb passes through a given cross-section in time of one second.



The coulomb :

It is the quantity of charge transferred by a constant current intensity of one ampere in time of one second.

What is meant by ...?

- **The electric current intensity passing through a conductor is 1.5 ampere.**
  - This means that the quantity of electric charge that passes through this conductor in one second equals 1.5 coulomb.

- **The quantity of electric charge that passes through a conductor in one second equals 1.5 coulomb.**
  - This means that the electric current intensity that passes through this conductor is 1.5 ampere.

Problems

1 ***Calculate the current intensity passing through a cross-section due to the flow of 5400 coulomb for 5 minutes.***

Solution

Time = 5 × 60 = 300 sec.

$$\text{Current intensity (I)} = \frac{\text{quantity of charge (q)}}{\text{time (t)}} = \frac{5400}{300} = 18 \text{ amp.}$$

2 *If an electric current of intensity 6 ampere passes through a conductor in 15 seconds, find the quantity of electric charge that passes through a cross-section of this conductor.*

Solution

$q = I \times t = 6 \times 15 = 90$ coulomb.

3 *What happens to the current intensity in the following cases :*

	Numerical application
(A) If the quantity of charge flows through a conductor increases to the double, and the time remains constant. Solution The current intensity increases to the double.	$q_1 = 100$ coulomb , $q_2 = 200$ coulomb $t_1 = 10$ sec. , $t_2 = 10$ sec. $I_1 = \frac{q_1}{t_1} = \frac{100}{10} =$ 10 amp. , $I_2 = \frac{q_2}{t_2} = \frac{200}{10} =$ 20 amp. increases to the double
(B) If the time of charge flows through a conductor increases to the double, and the quantity of charge remains constant. Solution The current intensity decreases to the half.	$q_1 = 100$ coulomb , $q_2 = 100$ coulomb $t_1 = 10$ sec. , $t_2 = 20$ sec. $I_1 = \frac{q_1}{t_1} = \frac{100}{10} =$ 10 amp. , $I_2 = \frac{q_2}{t_2} = \frac{100}{20} =$ 5 amp. decreases to the half
(C) If the quantity of charge flows through a conductor increases to the double, and the time decreases to the half. Solution The current intensity increases to four times.	$q_1 = 100$ coulomb , $q_2 = 200$ coulomb $t_1 = 10$ sec. , $t_2 = 5$ sec. $I_1 = \frac{q_1}{t_1} = \frac{100}{10} =$ 10 amp. , $I_2 = \frac{q_2}{t_2} = \frac{200}{5} =$ 40 amp. increases to four times

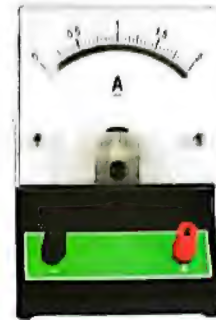
From the answers of problem (3), we can conclude that the electric current intensity passing through a conductor

is

Directly proportional to the **quantity of charge** flowing through a cross-section of this conductor, when the **time** remains **constant**.	**Inversly** proportional to the **time of charge** flowing through a cross-section of this conductor, when the **quantity of charge** remains **constant**.

Now, **we will study some other componants in the electric circuit.**

The ammeter apparatus

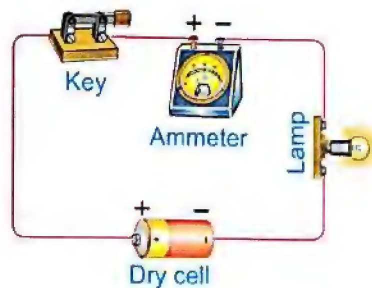


Ammeter

- **Use :** It is used in measuring the electric current intensity passing through the circuit.
- **The symbol :** It is given by the symbol $\overset{-}{}$(A)$\overset{+}{}$ in the electric circuit.
- **The connection :** It is connected in the electric circuits in series, as follows :

  A. The positive pole of the ammeter (**red pole**) is connected to the positive pole of the dry cell.

  B. The negative pole of the ammeter (**black pole**) is connected to the negative pole of the dry cell.



The reading of ammeter represents the value of current intensity passing through the electric circuit

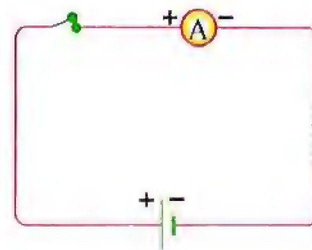


Figure represents the connection of ammeter in the electric circuits

Note

Ammeter is not connected directly to the battery, because this damages the ammeter.

Question

Complete the following :

1. The electric current intensity is directly proportional to the .... flowing through a cross-section of a conductor, when the time remains constant.
2. If the time of charge flows through a conductor increases to the double, the current intensity decreases to the half when the quantity of charge ....
3. The coulomb is the quantity of charge transferred by a constant current intensity of .... in time of ....

2 The electric potential difference

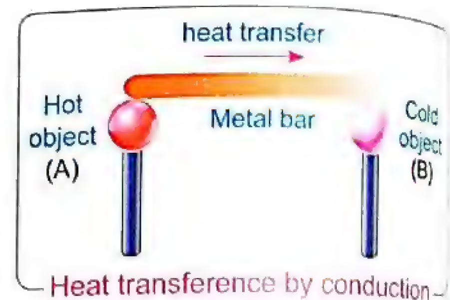
The electric potential of a conductor :

It is the state of an electric conductor that shows the transfer of electricity from or to it, when it is connected to another conductor.

To show what the potential difference means and how electricity is transferred through conductors, let's understand the following example :

Example

- If you have two objects, a hot object (A) and a cold object (B), then connect the two objects by a metal bar.
- You observe that the temperature of object (A) decreases gradually and that of object (B) increases gradually, until their temperatures become equal.

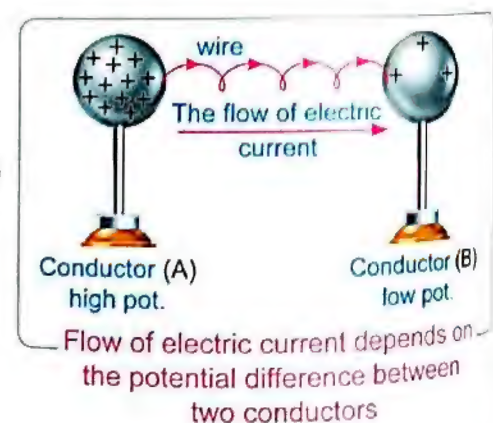


Heat transference by conduction

- This is because the heat energy moves from the hot object to the cold one.
- This movement does not depend on the amount of heat of the two objects. But it depends on the difference in their temperatures.
- Thus temperature difference determines the movement of heat energy to and from an object.

Similarly in electricity

- If two charged conductors touch or are connected with a wire and one of them conductor (A) has electric potential higher than the other conductor (B), electric energy (in the form of electric current) will flow from (A) to (B) until their electric potential become equal.
- Also, the transference of charges does not depend on their amount. But it depends on the difference in their potential.



Flow of electric current depends on the potential difference between two conductors

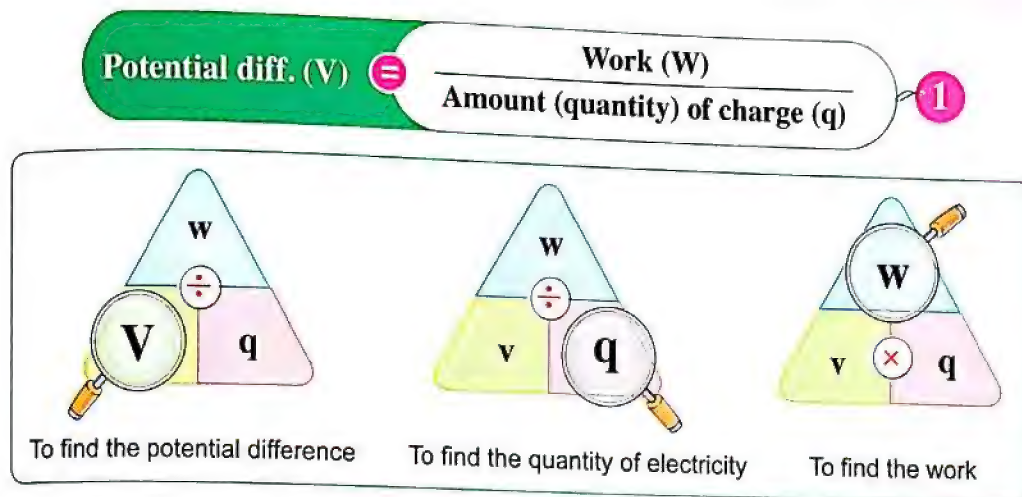
What happens when and why ...?

- **Two conductors that have the same electric potential are connected by a wire.**
  ➲ No electric current will pass through them, because there is no potential difference between them (potential difference = zero).

* **From the previous explanation, the potential difference across two terminals of a conductor can be defined as:**

The potential difference across two terminals of a conductor :

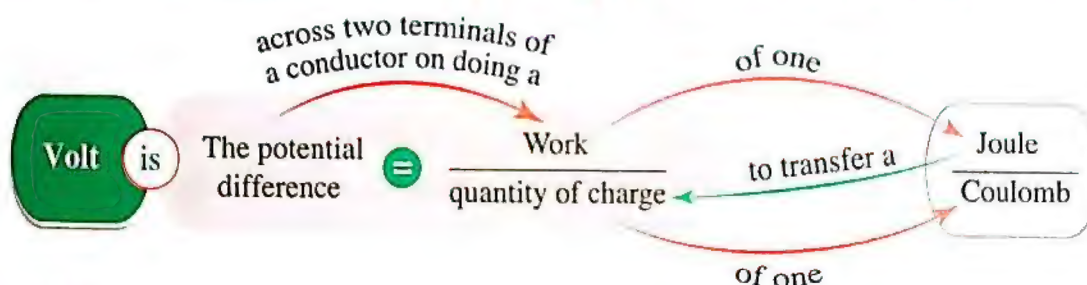
It is the value of the work done to transfer a quantity of charge of one coulomb between the two poles of this conductor.



- The measuring unit of the ***potential difference*** (V) is the "Volt".
- The measuring unit of ***the work*** (w) is the "Joule".
- The measuring unit of the ***quantity of electricity*** (q) is the "Coulomb".

$$1 \text{ Volt} = \frac{1 \text{ Joule}}{1 \text{ Coulomb}} \quad (2)$$

* **From the previous two relations (1) and (2), we can define the volt, as follows :**



The volt :

It is the potential difference across two terminals of a conductor on doing a work of one joule to transfer a quantity of charge of one coulomb.

What is meant by ...?

- **A work of 10 joule is done to transfer a charge of 5 coulomb between two points.**

➲ This means that the potential difference across the two points equals $\frac{10}{5} = 2$ volt.

Problems

1 ***If the work done to transfer an electric charge of 300 coulomb between two points is 33300 joule, calculate the potential difference across the two points.***

Solution

Potential difference (V) = $\frac{\text{Work (W)}}{\text{Charge (q)}} = \frac{33300}{300} = 111$ volt.

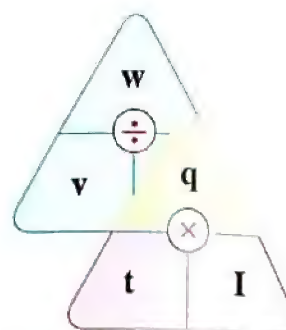
2 ***If the work done to transfer an electric charge between two points is 20 joule, and the time of charge flows through the conductor is 2 seconds, calculate the electric current intensity passes through the circuit.***

Solution

W = 20 joule, t = 2 sec., V = 5 volt, I = ?

$q = \frac{W}{V} = \frac{20}{5} = 4$ coulomb.

$I = \frac{q}{t} = \frac{4}{2} = 2$ amp.



3 ***What happens for the potential difference in the following cases ... ?***

	Numerical application
(A) If the work done through a conductor decreases to the half and the quantity of charge remains constant. **Solution** The potential difference decreases to the half.	$w_1 = 100$ Joule , $w_2 = 50$ Joule $q_1 = 50$ coulomb , $q_2 = 50$ coulomb $V_1 = \frac{w_1}{q_1} = \frac{100}{50} =$ 2 volt , $V_2 = \frac{w_2}{q_2} = \frac{50}{50} =$ 1 volt decreases to the half
(B) If the quantity of charge flows through a conductor decreases to the half, and the work remains constant. **Solution** The potential difference increases to the double.	$w_1 = 100$ Joule , $w_2 = 100$ Joule $q_1 = 50$ coulomb , $q_2 = 25$ coulomb $V_1 = \frac{w_1}{q_1} = \frac{100}{50} =$ 2 volt , $V_2 = \frac{w_2}{q_2} = \frac{100}{25} =$ 4 volt increases to the double
(C) If the work done through a conductor increases to the double, and the quantity of charge decreases to the half. **Solution** The potential difference increases to four times.	$w_1 = 100$ Joule , $w_2 = 200$ Joule $q_1 = 50$ coulomb , $q_2 = 25$ coulomb $V_1 = \frac{w_1}{q_1} = \frac{100}{50} =$ 2 volt , $V_2 = \frac{w_2}{q_2} = \frac{200}{25} =$ 8 volt increases to four times

From the answers of problem (3), we can conclude that the electric potential difference between two terminals of a conductor.

is

Directly proportional to the **work done** to transfer a quantity of charge through across section of this conductor, when the **quantity of charge** remains **constant**.

Inversly proportional to the **quantity of charge** flowing through a cross section of this conductor, when the **work done** remains **constant**.

The electromotive force

- The electric source (electric cell or battery) acts as a pump to maintain a continuous flow of electric current in the electric circuit.
- The power of this electric source is called the "**Electromotive force**" (**e.m.f.**).

The electromotive force (e.m.f.) :

It is the potential difference between the two poles of the battery when the electric circuit is open (no current passes through the circuit).

- The measuring unit of the *e.m.f* is the "Volt".

What is meant by ...?

- **The electromotive force of an electric cell is 1.1 volt.**

➲ This means that the potential difference between the two poles of the electric cell when the circuit is open is 1.1 volt.

The voltmeter apparatus

Voltmeter

Uses : It is used in measuring :

(a) The potential difference between two ends of a conductor.

(b) The electromotive force (e.m.f.) of the battery.

The symbol : It is given by the symbol −(V)+

The connection : It is connected in the electric circuits **in parallel**, as follows :

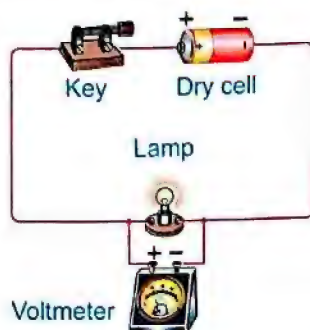
A. The positive pole of the voltmeter (**red pole**) is connected to the positive pole of the dry cell.

B. The negative pole of the voltmeter (**black pole**) is connected to the negative pole of the dry cell.

Connection of voltmeter in the electric circuits

1 in a closed circuit

It is connected **in parallel** between the two ends (terminals) of a conductor to measure the **potential difference**.



The reading of the voltmeter represents the value of the potential difference between the two ends of the lamp.

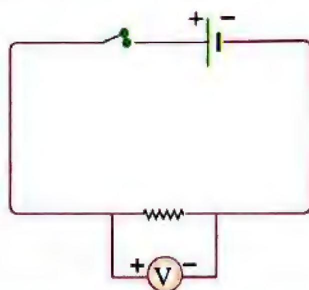
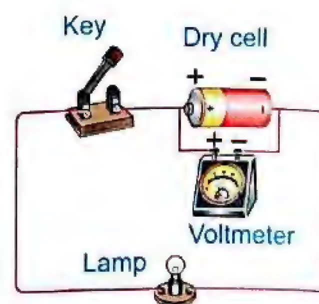


Figure represents the way of connection of the voltmeter in the closed circuit.

2 in an open circuit

It is connected **in parallel** between the poles of the dry cell or battery to measure the **electromotive force** of the battery.



The reading of the voltmeter represents the value of the e.m.f of the dry cell.

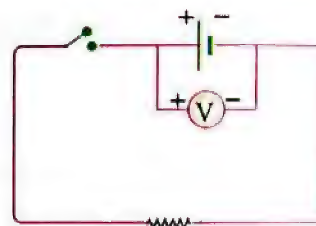


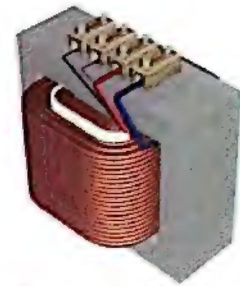
Figure represents the way of connection of the voltmeter in the open circuit.

Comparison between the voltmeter and the ammeter :

Points of comparison	The voltmeter	The ammeter
1 Its symbol :	—(V)—	—(A)—
2 Used for measuring :	a. The potential difference between two points in an electric circuit. b. The e.m.f of an electric source.	The current intensity through an electric circuit.
3 Type of connection in the electric circuit :	Parallel connection.	Series connection.
4 Measuring unit :	Volt	Ampere.

Science, Technology and Society

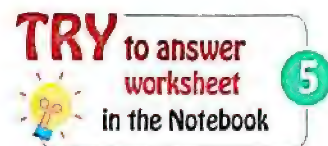
Technological application


Electric transformer

- **The electric potential at home and in electric equipment.**

The electric voltage at home is 220 volt.

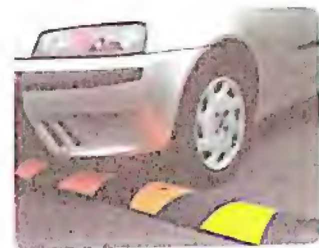
- Big electric appliances, such as washing machines and dishwashers use relatively high voltages of 110 - 240 volt.
- But electronic devices, such as mobile cell phones use relatively tiny voltage.
- If you connect a device of low voltage, directly at home of 220 volt source, it will damaged.
- So, you should use a device known as the electric transformer (step-down transformer) to reduce the electric potential of the electric source.



G.R. ***If you need to charge your mobile phone, you should use the electric transformer.***

To reduce the electric potential of the current used and get a suitable electric potential to charge the mobile.

3 The electric resistance (The resistor)


Bump

Cars face bumps when they pass on the way,

similary ...

The electric current faces an obstruction (resistance) when it passes through a conductor which affects its intensity.

The electric resistance :

It is the opposition that the electric current faces during its passing through a conductor.

- The apparatus used in measuring the ***electric resistance*** is the "Ohmmeter".
- The measuring unit of the ***electric resistance*** is the "Ohm".

Types of electric resistance

1 **The constant (fixed) resistance :**
Its symbol in the electric circuit is •∿∿∿•

2 **The variable resistance (Sliding rheostat) :**
Its symbol in the electric circuit is •∿∿∿ (with arrow)

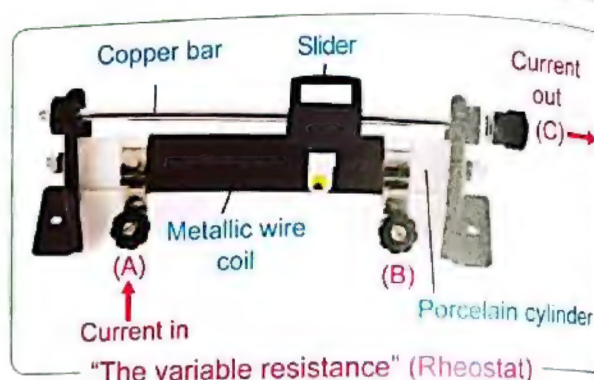
Now, we will study the variable resistance as an example of electric resistance :

The variable resistance (Sliding rheostat)

✻ **Its structure :** (as shown in the figure) :

1. **A metallic wire coil** of high resistance, that is coiled around a cylinder made of an insulating substance as porcelain and its two terminals are fixed by two connecting nails (A) and (B).

2. **A copper bar**, which is fixed by a connecting nail (C) from which the current out.



"The variable resistance" (Rheostat)

3. **A thin flexible copper sheet (slider)**, that moves on the copper bar and has a sliding contact with the metallic wire coil, and it can be moved along the metallic wire coil.

✻ **Its connection to the circuit :**

That is done through the two connecting nails (A) and (C).

NB We can use the sliding rheostat as a fixed (constant) resistance, if its connection to the electric circuit through the two connecting nails (A) and (B)

✻ **Its importance :**

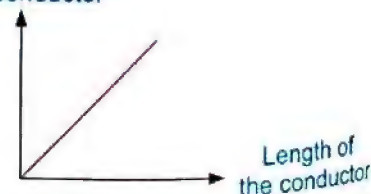
It is used to control the electric current intensity flowing through the circuit and the potential difference in the different parts of the circuit.

G.R. *The rheostat is used in the electric circuit.*

✻ **Its scientific base :**

The resistance of a conductor (metallic wire coil) is directly proportional to its length.

i.e.
- The resistance increases by increasing the length of the conductor (metallic wire coil).
- The resistance decreases by decreasing the length of the conductor (metallic wire coil).



The relation between the resistance of the conductor and its length

* **Its idea of operation :**

We can control the value of the resistance by controlling the length of the metallic wire coil that enters the electric circuit as follows :

By sliding the flexible copper sheet (slider) on the metallic wire coil, so the length of this metallic wire coil will change then the value of the resistance will change, and thus the current intensity will change also.

i.e.
- If we increase the length of the metallic wire coil, the resistance increases and the current intensity decreases.
- If we decrease the length of the metallic wire coil, the resistance decreases and the current intensity increases.

* **From the previous explanation, we can define the variable resistance (sliding rheostat), as follows :**

The variable resistance (Sliding rheostat) :

It is the resistance that you can change its value in order to adjust the value of the current intensity and the potential difference in the different parts of the circuit.

Comparison between potential difference (V), electric current intensity (I) and electric resistance (R) concerning measuring unit and apparatus used:

Points of comparison	Potential difference (V)	Current intensity (I)	Electric resistance (R)
1 Measuring unit :	Volt	Ampere	Ohm
2 Apparatus used :	Voltmeter	Ammeter	Ohmmeter

* **Make sure you know most of the basic electric symbols :**

Electric source	Resistance	Switch (Key)	Bulb
Cell	Fixed resistor	Closed switch	Light bulb
Battery	Variable resistor	Opened switch	

▸ **Enriching information**

- *Inside the fuel tank of a car, there is a pointer connected to a changeable resistance that controls the flow of the electric current in the car's fuel scale.*
- *When the level of the fuel is low, an electric current flows in a circuit causing the deviation of fuel pointer indicating that the car needs the fuel.*

G.R. ***Rheostat is used in some electric circuits.***
To control the electric current intensity in the electric circuit and consequently the electric potential difference between its ends.

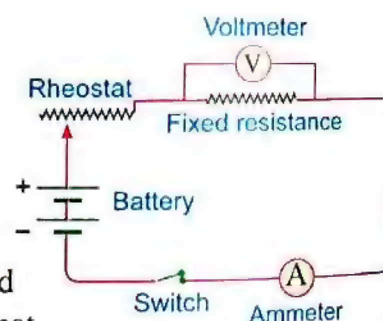
The relation between the current intensity and the potential difference (Ohm's law)

- The German physicist "George Simon Ohm" who discovered the quantitative properties of the electric current, also he discovered a law in electricity that shows the relation between the electric current and the potential difference which is known as "Ohm's law".

Ohm

Activity **The relation between current intensity and potential difference:**

Steps:

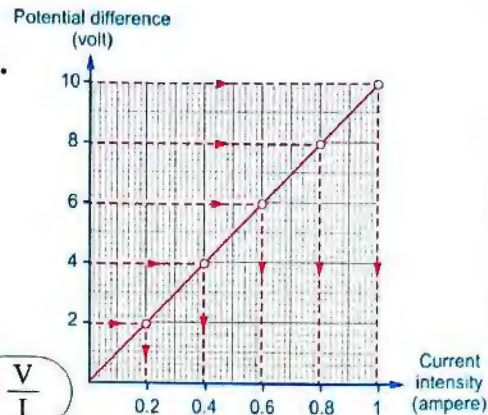


1. Connect an electric circuit (as shown in the fig.) consisting of a battery, a rheostat, a voltmeter (V), fixed resistance, an ammeter (A) and a key.
2. Close the key, then determine the reading of voltmeter (potential difference between the two terminals of the fixed resistance) and the reading of ammeter (current intensity that passes through the fixed resistance).
3. Change the length of the metallic wire coil by moving the flexible copper sheet (slider), then determine the reading of voltmeter and ammeter.
4. Repeat the previous step several times by changing the variable resistance each time and record your reading in a table then represent it graphically.
5. Calculate the value of $\frac{V}{I}$ in each case.

Voltmeter reading (V)	2	4	6	8	10
Ammeter reading (I)	0.2	0.4	0.6	0.8	1
$\frac{V}{I}$	10	10	10	10	10

Observation:

The ratio = $\frac{\text{Potential difference (V)}}{\text{Current intensity (I)}}$ = **Constant value.**



i.e. $V \propto I$ $\therefore V = \text{Constant} \times I$

The constant value is given by the symbol (R) and it is equal to the value of the fixed resistance.

$\therefore V = R \times I$

So, the mathematical form of Ohm's law is : $R = \frac{V}{I}$

Conclusion:

The electric current intensity passing through the constant (fixed) resistance is directly proportional to the potential difference between its terminals, which is known as Ohm's law.

From the previous activity, we can define the Ohm's law, as follows :

Ohm's law :

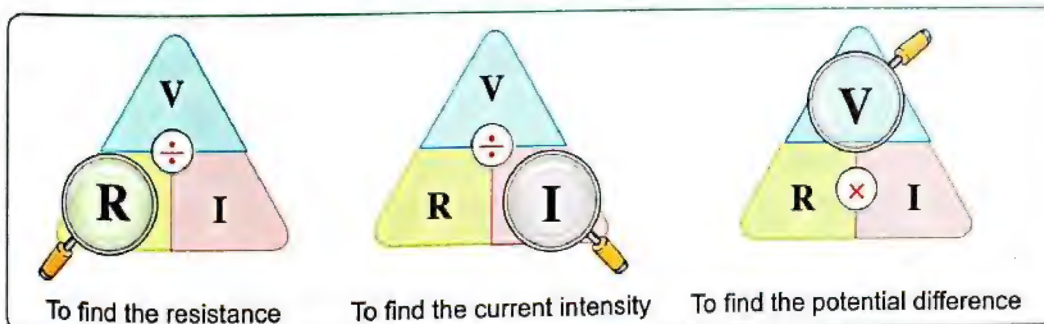
The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.

From Ohm's law, we can define the electric resistance of a conductor as follows :

The electric resistance of a conductor :

It is the ratio between the potential difference across the two ends of a conductor (resistor) and the current intensity passing through it.

$$\text{Electric resistance (R)} = \frac{\text{Potential difference (V)}}{\text{Current intensity (I)}}$$ 1



To find the resistance To find the current intensity To find the potential difference

- The measuring unit of the **resistance** (R) is the **"ohms"**.
- The measuring unit of the **potential difference** (V) is the **"volts"**.
- The measuring unit of the **current intensity** (I) is the **"amperes"**.

$$1\ \text{Ohm} = \frac{1\ \text{Volt}}{1\ \text{Ampere}} \quad (2)$$

What is meant by the resistance of a conductor = 25 ohm ...?

➲ This means that the ratio between the potential difference across the two ends of this conductor and the current intensity passing through it = 25 ohm.

From the previous two relations (1) and (2), we can define the ohm, the ampere and the volt, as follows:

The ohm :

It is the resistance of a conductor which allows passing an electric current intensity of one ampere when the potential difference between its terminals is one volt.

$$\text{Ohm} = \frac{\text{Volt}}{\text{Ampere}}$$

The ampere :

It is the current intensity passing through a conductor whose resistance is one ohm when the potential difference between its terminals is one volt.

$$\text{Ampere} = \frac{\text{Volt}}{\text{Ohm}}$$

The volt :

It is the potential difference across the two terminals of a conductor whose resistance is one ohm when the current intensity passing through it is one ampere.

$$\text{Volt} = \text{Ohm} \times \text{Ampere}$$

What happens in the following cases ...?

- **Burning of the fixed resistance in an electric circuit (concerning : the reading of an ammeter connected to the circuit in series and that of a voltmeter connected to the battery in parallel).**

  ➲ The reading of the ammeter = Zero , but the reading of the voltmeter still as it is.

- **Increasing the potential difference between the two terminals of a conductor to double its value , at constant temperature (concerning : the electric current intensity).**

  ➲ The electric current intensity will increase to double its value.

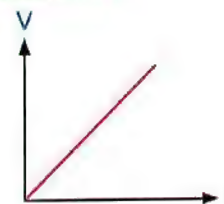
- **Increasing the value of the electric resistance to double its value , at constant temperature (concerning the electric current intensity).**

➲ The electric current intensity will decrease to half its value.

From the previous explanation, we can conclude the following relations :

1. The potential difference (V) is directly proportional to the current intensity (I) at constant temperature.

   i.e. By increasing the current intensity, the potential difference will increase and vice versa.



2. The current intensity (I) is inversly proportional to the resistance (R) at constant potential difference.

   i.e. By increasing the resistance, the current intensity will decrease and vice versa.

Problems

1 ***If an electric current of 0.2 ampere passes through an electric heater and the potential difference between its two ends is 220 volt, calculate the heater's resistance.***

Solution

$$\text{Resistance (R)} = \frac{\text{Potential difference (V)}}{\text{Current intensity (I)}} = \frac{220}{0.2} = 1100 \text{ ohm.}$$

2 ***Label the parts of the opposite electric circuit, then calculate the value of (R).***

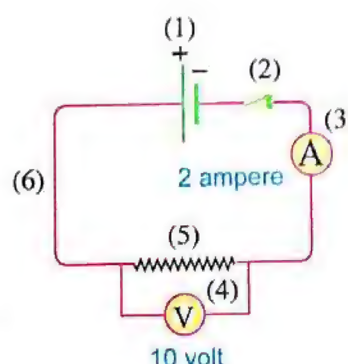
Solution

(1) Electric cell. (2) Key.

(3) Ammeter. (4) Voltmeter.

(5) Fixed resistance. (6) Connecting wires.

$R = \frac{V}{I} = \frac{10}{2} = 5$ ohm.



In the previous electric circuit, if the resistance (R) is replaced with another (R̀) which is 20 ohm and the intensity of the electric current becomes 0.2 ampere.

Calculate the potential difference across the two end of the new resistance.

Solution

$V = \grave{R} \times I = 20 \times 0.2 = 4$ volt.

3 ***Calculate the quantity of charge passes through a conductor, whose resistance equals 1000 ohm for 30 min., if the potential difference between its poles equals 220 volt.***

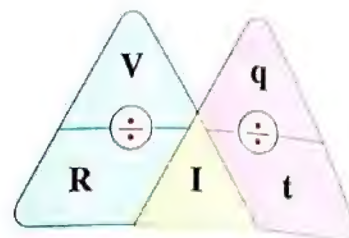
Solution

R = 1000 ohm, $t = 30 \times 60 = 1800$ sec.,

V = 220 volt. q = ?

$I = \frac{V}{R} = \frac{220}{1000} = 0.22$ amp.

$q = I \times t = 0.22 \times 1800 = 396$ coulomb.



4 ***Calculate the amount of work needed to pass an electric charge 500 coulomb across a conductor with a resistance 3 ohm and the electric current intensity passes through is 2 amp.***

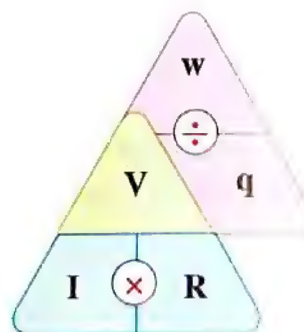
Solution

q = 500 coulomb, R = 3 ohm,

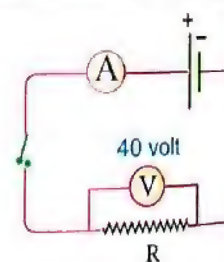
I = 2 amp. , w = ?

$V = R \times I = 3 \times 2 = 6$ volt.

$w = v \times q = 6 \times 500 = 3000$ joule.



5 ***In the opposite figure :***
Calculate the current intensity passing, if the work done to transfer the electric charge is 240 Joule and the time of flowing is 2 seconds.



Solution

The quantity of electricity $= \frac{w}{v}$

$= \frac{240}{40} = 6$ coulomb.

The current intensity $= \frac{q}{t} = \frac{6}{2} = 3$ ampere.

Exercise 2

Write the scientific term :

1. The current intensity passing through a conductor whose resistance is one ohm and the potential difference between its terminals is one volt.

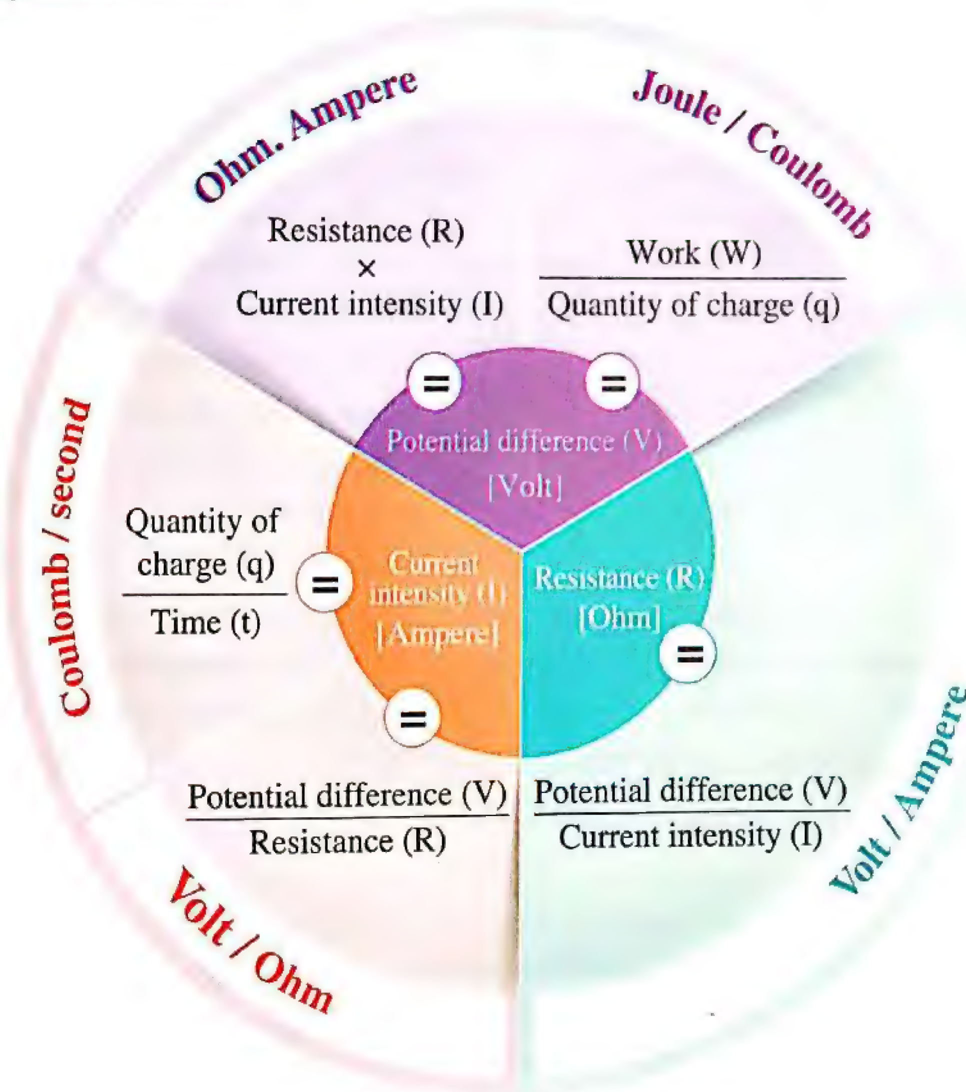
2. The ratio between the potential difference across the two ends of a conductor and the current intensity passing through it.

Answer

1. Ampere. 2. Resistance of a conductor.

TRY to answer worksheet **6** in the Notebook

Summary of the most important physical quantities, its measuring units and its equivelant units :



Exercise 3

Solve the following :

Mention the physical quantity which is measured by each of the following units :

(1) Joule / Volt. Second. (2) Volt. Second / Ohm. (3) Joule / Ampere. Second.

(4) Volt. Ampere. Second. (5) Volt. Second / Coulomb.

The idea of solution :

(1) $\frac{\text{Joule}}{\text{Volt. second}}$ $\xrightarrow{\text{The physical quantity which it measures}}$ $\frac{\text{Work (W)}}{\text{Potential difference (V)} \times \text{Time (t)}} = \frac{\text{Quantity of charge (q)}}{\text{Time (t)}} =$ **Current intensity (I)**

(2) $\frac{\text{Volt. second}}{\text{Ohm}}$ $\xrightarrow{\text{The physical quantity which it measures}}$ $\frac{\text{Potential difference (V)}}{\text{Resistance (R)}} \times \text{Time (t)} = \text{Current intensity (I)} \times \text{Time (t)} =$ **Quantity of charge (q)**

(3) $\frac{\text{Joule}}{\text{Ampere. second}}$ $\xrightarrow{\text{The physical quantity which it measures}}$ $\frac{\text{Work (W)}}{\text{Current intensity (I)} \times \text{Time (t)}} = \frac{\text{Work (W)}}{\text{quantity of charge (q)}} =$ **Potential difference (V)**

(4) Volt. ampere. second $\xrightarrow{\text{The physical quantity which it measures}}$

Potential difference (V) × Current intensity (I) × Time (t) = Potential difference (V) × Quantity of charge (q) = **Work (W)**

(5) $\frac{\text{Volt. second}}{\text{Coulomb}}$ $\xrightarrow{\text{The physical quantity which it measures}}$ $\frac{\text{Potential difference (V)} \times \text{Time (t)}}{\text{Quantity of charge (q)}} = \text{Potential difference (V)} \times \frac{1}{\text{Current intensity (I)}}$

= Resistance (R)

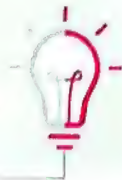
Answer

(1) Current intensity (I). (2) Quantity of charge (q). (3) Potential difference (V).

(4) Work (W). (5) Resistance (R).

Remember

Lesson One



Electric current :

It is the flow of electric negative charges (electrons) through a conducting material (as a metal wire).

Physical properties of the electric current are :

1. Current intensity. 2. Potential difference. 3. Electric resistance.

1. The electric current intensity :

It is the quantity of electricity in coulomb or the electric charges flowing through a cross-section of the conductor in one second.

$I = \frac{q}{t}$

- The measuring unit of current intensity is the **Ampere**.
- Electric current intensity is measured by **Ammeter** which is connected in **series**.

☆ **Electric potential of a conductor :**

It is the state of an electric conductor that shows the transfer of electricity from or to it, when it is connected to another conductor.

2. The potential difference across two terminals of a conductor :

It is the value of the work done to transfer a quantity of charge (1 coulomb) between the two poles of this conductor.

$V = \frac{W}{q}$

- The measuring unit of potential difference is the **Volt**.
- Potential difference is measured by **Voltmeter** which is connected in **parallel**.

☆ **Electromotive force (e.m.f.) :**

It is the potential difference between the two poles of the battery when the electric circuit is open (no current passes through the circuit).

- Electromotive force is measured by the **Voltmeter** and its measuring unit is the **Volt**.

3. The electric resistance :

It is the opposition that the electric current faces during its passing through a conductor.

- Electric resistance is measured by **Ohmmeter** and its measuring unit is the **Ohm**.

Types of electric resistance are :

(A) Constant (fixed) resistance. (B) Variable resistance (Rheostat).

- Rheostat is used in the electric circuit to control the current intensity and the potential difference.

Ohm's law :

The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.

- The mathematical form of Ohm's law is $R = \frac{V}{I}$

Questions ? on lesson One

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

Interactive Exercises

1. Choose the correct answer :

1. Electrons are .... charged particles.
   a. positively b. neutral c. negatively d. variable
2. The flow of electric charges through a metal wire represents ....
   a. resistance. b. electric current intensity.
   c. electric current. d. potential difference. *(Sharkia, Damietta 20..)*
3. 📖 The .... is the measuring unit of the electric charges. *(Alex. 20..)*
   a. coulomb b. ampere c. volt d. ohm
4. 📖 The measuring unit of the electric current intensity is .... *(Fayoum, Gharbia 20..)*
   a. ampere. b. volt. c. ohm. d. coulomb.
5. The ampere = ...
   a. $\frac{\text{joule}}{\text{coulomb}}$ b. $\frac{\text{coulomb}}{\text{sec.}}$ c. $\frac{\text{joule}}{\text{sec.}}$ d. $\frac{\text{sec.}}{\text{coulomb}}$
6. If an electric current of 0.2 ampere flows through an electric heater and the potential difference between its two ends is 220 volt, whose resistance is equal to .... ohm.
   a. 1100 b. 11 c. 110 d. 11000 *(Menofia 2017)*
7. If a quantity of electricity 30 coulomb passes in a time 10 second through a conductor, so the current intensity equals .... ampere. *(Damietta 20..)*
   a. 300 b. 3 c. 40 d. 30
8. The quantity of electricity flow in a conductor on passing electric current of intensity (2 ampere) through a cross-section of a conductor within a time (20 minute) equal .... coulomb.
   a. 10 b. 20 c. 4 d. 2400 *(Giza 20..)*
9. The .... is known as the quantity of electric charges flowing through a cross-section of the conductor in one second.
   a. ampere b. coulomb
   c. electric resistance d. current intensity
10. The charges which transmitted by a current of one ampere in one second, is known as ....
    a. coulomb. b. volt. c. ampere. d. ohm. *(Cairo 20..)*
11. 📖 The ammeter is used to measure the .... in the electric circuit. *(Dakhalia 20..)*
    a. potential difference b. current intensity
    c. resistance d. e.m.f

12. The measuring unit of the amount of electricity is the coulomb. It doesn't equal with ....
(Qalyoubia 2017)

a. amp. × sec. b. $\frac{\text{joule}}{\text{volt}}$ c. volt × joule. d. (a) and (b).

13. All of the following are used to measure the electric current intensity except ....

a. ampere.
b. coulomb/second.
c. joule/coulomb.
d. volt/ohm. (Luxor 2017 / Beni Suef 2018)

14. For measuring the potential difference by direct method the .... apparatus is used.

a. ammeter b. voltmeter c. ohmmeter d. voltammeter

(Damietta 2016)

15. To transfer electric charge of 10 coulomb between two points the potential difference between them is 20 volts, ... joules are needed. (Alex. 2019)

a. $\frac{1}{2}$ b. 2 c. 20 d. 200

16. If the work done to transfer an electric charge of 2 coulomb between two points is 100 joule, the potential difference between these two points will be .... volt.

a. 50 b. 100 c. 200 d. 0.5

17. The unit that is used in measuring work is .... (Gharbia 2014)

a. ampere. b. joule. c. coulomb. d. ohm.

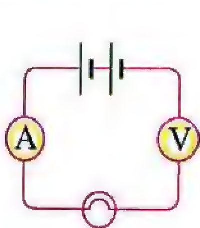
18. 🕮 The .... is used to measure the e.m.f of a battery.

a. voltmeter b. ammeter c. rheostat d. ohmmeter

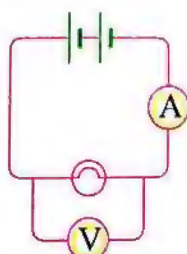
19. 🕮 The measuring unit of e.m.f is .... (Cairo, Qalyoubia 2021)

a. coulomb. b. ampere. c. ohm. d. volt.

20. Which of the following figures represents the right connection of the ammeter and voltmeter in a circuit ? ....



a.

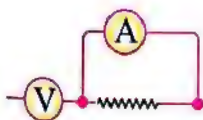


b.

c.

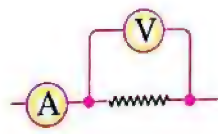
d.

21. Which one of the following figures represents a part of an electric circuit that contains an ammeter and voltmeter connected in right way ? ....

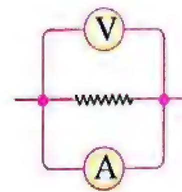


a.

b.



c.



d.

22. The value of the work done to transfer a quantity of electric charges of one coulomb between the two poles of this conductor is the .... (Menofia 2014)
a. ohm.
b. potential difference.
c. current intensity.
d. electric resistance.

23. The joule equals .... (Menia 2017)
a. volt/coulomb. b. volt/coulomb. c. coulomb/sec. d. volt/sec.

24. The physical quantity which its measuring unit equivalent (joule / volt. second) is ....
a. current intensity.
b. potential difference.
c. work done.
d. quantity of electricty. (Red Sea 2015)

25. When 1.5 V is written on an electric cell, this means that its .... equals 1.5 volt.
a. electric intensity b. e.m.f c. stored energy d. resistance

26. If the quantity of charge which passes in an electric wire is doubled and the time of its passing decreases to its half, the current intensity will ....
a. increase four times.
b. decrease to quarter.
c. doubled.
d. does not change. (Beni Suef 2021 / Menia 2016)

27. In an electric resistance of 20 ohms, if the current intensity passing through it is doubled, its value becomes .... ohms. (Behira 2019)
a. 10 b. 20 c. 30 d. 40

28. An electric current, whose intensity is one ampere passes through a resistance of 20 ohm, then the intensity of the electric current increases to 2 ampere in the same resistance, so the value of resistance .... (Qalyoubia 2016 / Matrouh, Behira 2018)
a. increases to double.
b. decreases to half.
c. decreases to quarter.
d. does not change.

29. We can control the value of the current intensity that passes in the different parts of the circuit by using the .... (Gharbia 2018)
a. ammeter. b. ohmmeter. c. rheostat. d. voltmeter.

30. We can control the value of the electric resistance by using .... (Cairo 2021)
a. ammeter. b. ohmmeter. c. rheostat. d. voltmeter.

31. The unit that is used in measuring the electric resistance is .... (Giza, Port Said 2014)
a. ohm. b. ampere. c. volt. d. coulomb.

32. The .... is used to measure the electric resistance. (Alex, Port Said, Menia 2018)
a. ammeter b. voltmeter c. ohmmeter d. rheostat

33. The ratio between the potential difference across two ends of a conductor and the electric current intensity passing through it, is equal to .... (Gharbia 2019)
a. electromotive force.
b. work done.
c. quantity of electricity.
d. electric resistance.

34. The resistance of the conductor which carries a current of 1 ampere when the potential difference between its two ends is 1 volt equals ....

a. 1 ampere. b. 1 volt. c. 1 ohm. d. 1 coulomb.

35. 🕮 In the electric circuit, the sliding rheostat is used to ....

a. measure the electric current intensity. b. measure the potential difference.
c. change the resistance value. d. open and close the circuit. *(Ismailia 2021)*

36. The apparatus used to control the value of electric resistance in the circuit is the ....

a. ohmmeter. b. ammeter. c. rheostat. d. voltmeter.

(New Valley 2018)

37. The symbol that indicates the variable resistance is ....

a. —⁄•— b. (variable resistor symbol) c. •—ʌʌʌʌ—• d. (b) and (c)

38. In rheostat, slider is moved on .... bar.

a. aluminium b. copper c. carbon d. iron

39. Insulated material used in manufacture of electric devices is .... *(Dakahlia 2019)*

a. platinum. b. lead. c. tungsten. d. porcelain.

40. According to Ohm's law at constant temperature, if the potential difference between terminals of a conductor is doubled so the resistance of this conductor is ....

a. doubled. b. remain constant c. decreases to half. d. increases 4 time.

(Menofia 2019)

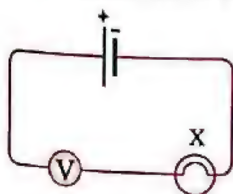
41. The value of the resistance of an electric conductor in an electric circuit is changed on changing .... *(Luxor 2015 / Matrouh 2017)*

a. dimensions of the conductor.
b. electric current intensity passing through it.
c. potential difference between its terminals.
d. other electric circuit components.

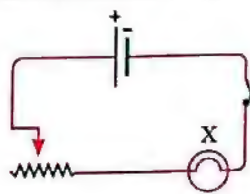
42. As the length of the wire of rheostat increases, the current intensity .... *(Alex. 2019)*

a. increases and no change in the resistances.
b. decreases as the resistance increased.
c. doesn't change and the resistance increases.
d. increases as the resistance decreased.

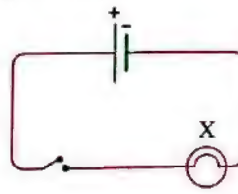
43. We can control the illumination of bulb (X) in circuit ....



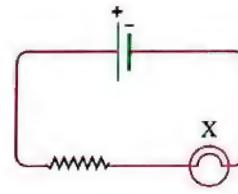
a.



b.

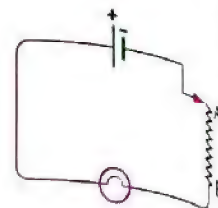


c.



d.

44. In the electric circuit in front of you, when the slider of the rheostat moves from point (A) to point (B), the intensity of light in the electric lamp ....



a. increases.
b. decreases.
c. doesn't change.
d. becomes zero.

45. During the connection of an electric circuit to verify Ohm's law, the teacher advised his students to connect a rheostat to the circuit to ....

a. measure the current intensity.
b. measure the potential difference.
c. control the current intensity.
d. switch on and off the electric circuit.

(Menofia 201..)

46. Electric current intensity = ...

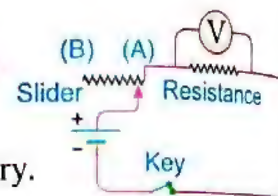
a. $q \times t$
b. $\frac{q}{t}$
c. $V \times R$
d. $\frac{R}{V}$

(Assiut , Damietta 201..)

47. .... is the mathematical relation of Ohm's law.

a. $R = \frac{V}{I}$
b. $I = RV$
c. $R = V \times I$
d. $V = \frac{R}{I}$

48. In the opposite figure, if the slider of the rheostat moves from (A) to (B) then the voltmeter reading .... *(Behira 2019)*



a. increases.
b. decreases.
c. no change.
d. equal to the value of e.m.f of the battery.

49. The ratio between the potential difference between the two ends of a conductor and the electric current intensity passing through it, is equal to the ....

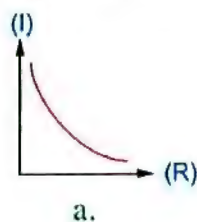
a. e.m.f.
b. electric current.
c. quantity of electricity.
d. electric resistance.

(Cairo 201..)

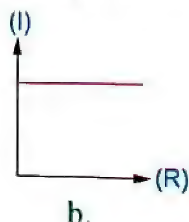
50. One volt equals ....

a. ampere × ohm.
b. joule/coulomb.
c. coulomb/sec.
d. (a) and (b).

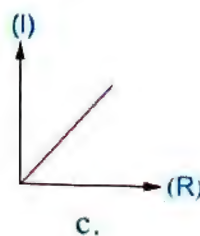
51. Figure .... shows the relation between current intensity passing through a conductor and its resistance when the temperature is constant. *(Menia 201..)*



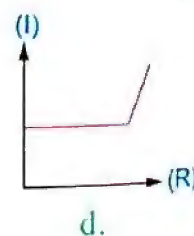
a.



b.

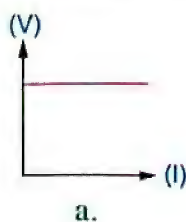


c.

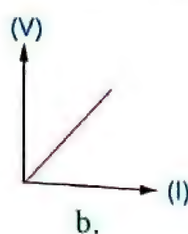


d.

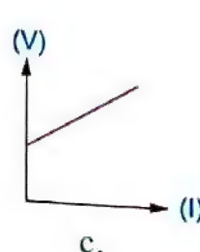
52. The diagram .... verifies Ohm's law. *(Matrouh 2019)*



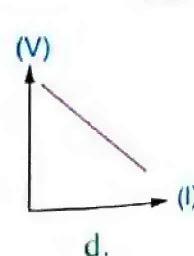
a.



b.

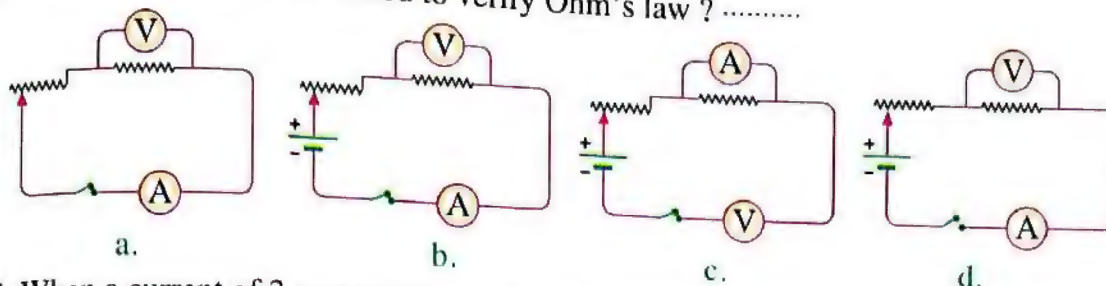


c.



d.

53. Which electric circuit is used to verify Ohm's law ? ....



54. When a current of 3 ampere passes through a closed electric circuit containing a resistance of 2 ohm, the reading of the voltmeter connected in parallel to the resistance is .... volt.

a. 1.5 b. 6 c. $\frac{2}{3}$ d. $\frac{1}{6}$

2. Choose from column (B) what suits it in column (A) :

1.

(A)	(B)
1. Electric state of a conductor is called	a. electric potential.
2. Electric quantity is called	b. battery.
3. The obstruction of a conductor is called	c. electric resistance.
4. The electric pump is called	d. electric intensity.
	e. electric charge.

2.

(A)	(B)
1. Ampere	a. Joule / Coulomb
2. Volt	b. Volt / Ampere
3. Ohm	c. Joule / Second
	d. Coulomb / Second

(Behira 2016)

3. Rewrite the following statements after correcting the underlined words :

1. <u>The ampere</u> is the charge transferred by a constant current of one ampere in one second. *(Matrouh 2013)*
2. Joule = <u>Ampere</u> × Volt.
3. The unit of measuring the electric charges is <u>volt</u>. *(Ismailia 2018)*
4. The unit of measuring the electromotive force (e.m.f.) is the <u>ampere</u>. *(Fayoum 2019)*
5. Volt is the potential difference across the terminals of a conductor when the work done to transfer a quantity of charge of one coulomb between the two points is one <u>second</u>.
6. If the work done to transfer an electric charge of 300 coulombs between two points is 33300 joules, the potential difference between the two points is <u>222</u> volts. *(Gharbia 2016)*
7. The voltmeter is connected in <u>series</u> in the electric circuits. *(Cairo 2019)*
8. The <u>ammeter</u> measures the potential difference between the two ends of a conductor. *(New Valley, South Sinai 2017)*

9. The **voltmeter** is used to measure the electric resistance. (Fayoum 2013)
10. The **ammeter** is used in changing the resistance. (Kafr El-Sheikh 2015)
11. The ammeter is connected **parallel** in an electric circuit. (Gharbia 2021 / Fayoum 2018)
12. The e.m.f of an electric source is the **electric potential** between its two poles when the circuit is open. (Luxor 2016)
13. **Ohm** equals (joule / ampere.second). (Red Sea 2017)
14. The electric current intensity passing through a conductor is directly proportional to the **resistance** between its ends at a constant temperature. (Dakahlia 2019)
15. **The e.m.f** is the ratio between the potential difference across the conductor to the current intensity flowing through it.
16. Electromotive force can be defined as the potential difference between the two poles of the battery when **current intensity of one ampere passes in the circuit**. (Dakhalia 2017)
17. **The electric current intensity** is the state of an electric conductor that shows the transfer of the electricity to and from it when it is connected to another conductor. (Damietta 2018)
18. The resistance of a conductor that 1 ampere is passed through it when the potential difference between its terminals is 1 volt equals **10 ohm**. (Cairo , Port Said 2014)
19. If the fixed resistance is spoiled in the circuit used to prove Ohm's law, the ammeter reading is **infinite**. (Qalyoubia 2014)
20. The mathematical relation of Ohm's law is **$R = I \times V$** (Gharbia 2014 / Sohag 2016)
21. If the potential difference between the two ends of a conductor is 3 volt, and an electric current intensity of one ampere passes in it, the resistance of the conductor is **one ohm**.
22. If the length of the wire increase, the resistance increases and the current intensity **increases**. (Ismailia 2015)

4. Write the scientific term of each of the following :

1. Positively charged particles found in the nucleus of an atom.
2. Negatively charged particles that rotate around the nucleus.
3. The flow of electric negative charges in a conducting material (metal wire). (Suez , Port Said 2021)
4. The quantity of charge which transferred by a current intensity of one ampere in one second. (Menofia , Damietta 2021)
5. The electric current intensity passing through a circuit when a charge of one coulomb passes through a given cross-section in one second. (El-Menia 2021)
6. The current intensity produced by flowing one coulomb of electric charges in one second through a conductor.
7. • The quantity (amount) of electric charges that flow through a conductor in a time of one second. (Luxor 2015 / Sohag, New Valley 2018)
   • The quantity of electricity (electric charges) in coulomb flowing through a cross-section of a conductor in one second. (Qalyoubia 2021 / Fayoum 2018)

8. 📖 A device used to measure the electric current intensity passing in a conductor. *(Kafr El-Sheikh, Qena 2021)*

9. A device used to control the electric current intensity passing in the electric circuit. *(Menofia 2016)*

10. A device used to raise or reduce voltage of the home electric equipment. *(Ismailia 2017)*

11. 📖 The electric state of a conductor that shows the transference of electricity from or to it, when it is connected to another conductor. *(Menofia , Sharkia 2021)*

12. The value of the work done to transfer a quantity of charge (one coulomb) between two ends of this conductor. *(Alex. 2021 / Damietta 2019)*

13. The potential difference between two terminals of a conductor on doing a work of one joule to transfer a quantity of charge of one coulomb. *(Luxor 2014 , 2017 / Beni Suef 2018)*

14. The potential difference between two poles of an electric source when the electric circuit is open. *(Qalyoubia 2018 / Sohag 2019)*

15. 📖 The measuring unit of the electromotive force of the electric cell.

16. A physical quantity which is measured by (volt × coulomb). *(Red Sea 2016 / Behira 2018)*

17. An apparatus used to measure the electromotive force. *(Fayoum 2017)*

18. Used in some electric circuits to control current intensity as the resistance is directly proportional with the length of the wire. *(Menofia 2019)*

19. 📖 The obstruction (opposition) that the electric current faces during its flow in the conductor. *(Dakahlia , Ismailia 2019)*

20. 📖 The resistance of a conductor that allows the passing of an electric current of 1 ampere through it when the potential difference across its ends is 1 volt. *(El-Menia 2021 / Behira 2019)*

21. The resistance that you can change its value in order to adjust the value of the current intensity and the potential difference in the different parts of the circuit.

22. An instrument used in measuring the electric resistance.

23. The electric current intensity is directly proportional to the potential difference between two terminals of a conductor at a constant temperature. *(Dakhalia, Sohag 2017)*

24. The ratio between the potential difference across the two ends of a conductor and the electric current intensity passing through it. *(Matrouh 2018)*

25. The ratio between the work done and the quantity of electric charge which passing between two points. *(Sharkia 2021 / Behira 2017)*

26. The potential difference across the terminals of a conductor when its resistance is one ohm and the current intensity flowing through it is one ampere.

27. The current intensity passing through a conductor when its resistance is one ohm and the potential difference across its terminals is one volt. *(Cairo 2019)*

5. Complete the following sentences :

1. There are several physical properties of the electric current as the .... , potential difference and ....

2. The electric current is the flow of .... through conducting material. *(Giza 2016)*

3. The quantity of electric charge passing through a conductor = ... × ....

4. The measuring unit of the quantity of electricity (charge) is .... *(Menofia 2014 / Kafr El-Sheikh 201..)*

5. The current flows through the circuit only when the circuit is ....

6. The current intensity due to the flow of 2700 coulomb in 300 second through a cross-section of a conductor equals ....

7. The .... apparatus is used to measure the electric current intensity in units known as .... *(Luxor 2016 / Red Sea 2017 / Ismailia 202.)*

8. On connecting two charged conductors, the electric current passes from the conductor with .... potential to the conductor which has .... potential. *(Fayoum 2016 / Port Said, Red Sea 201.)*

9. Transmission of electric charges depends on the .... between two conductors, and it does not depend on .... *(Alex., Dakhalia 201.)*

10. Electric current doesn't flow between two conductors, their electric potential are ....

11. The instrument which is used to measure the electric potential difference is .... *(Cairo 201.)*

12. .... is measured by using voltmeter and has a measuring unit known as .... *(Sohag 2016 / Ismailia 201.)*

13. In the electric circuits, the ammeter is connected in ...., while the voltmeter is connected in .... *(Qalyoubia 2014 / Kafr El-Sheikh 201.)*

14. Volt = $\dfrac{\text{Joule}}{\text{..........} \times \text{..........}}$ *(Matrouh 201.)*

15. Volt is the potential difference between terminals of conductor when work done of .... to transmit quantity of charge of .... between them. *(Dakhalia 201.)*

16. The .... is used to measure the electromotive force of a battery in units known as .... *(Alex. 2015 / Cairo 2017 / Suez 201.)*

17. The .... apparatus is used to measure the electormotive force. *(Gharbia 2021 / Qena 201.)*

18. An instrument called .... is used to measure the electric current intensity, whereas the electric resistance in measured by instrument called .... *(Fayoum 201.)*

19. When no current passes through a circuit, then the reading of the voltmeter connected to a battery indicates ....

20. The .... is connected in parallel to the electric source in the circuit to measure the ....

21. In the electric circuits, ... instrument is symbolized by –(V)– and .... instrument is symbolized by –(A)–

22. The resistance that faces the flow of electric current in a conductor is known as the ....
(Assiut 2015 / Sohag 2017)

23. The .... apparatus is used to measure the electric resistance in the circuit.
(Cairo , Sharkia 2021)

24. The measuring unit of the resistance in the circuit is .... *(Cairo 2016)*

25. .... is used to change the electric resistance in an electric circuit. *(Giza 2015)*

26. The sliding rheostat controls .... , so it controls .... *(Suez 2014)*

27. The types of electric resistance are .... and ....

28. The resistance of a conductor that 1 ampere is passed through it when the potential difference between its terminals is 1 volt = ... *(Behira 2017)*

29. In the electric circuit, the variable resistance is symbolized by .... and fixed resistance by ....

30. Rheostat is composed of a metallic wire of .... resistance coiled around an insulated cylinder made of an insulating substance as ....

31. In the circuit, if the length of the wire of rheostat increases, the resistance .... and the current intensity ....

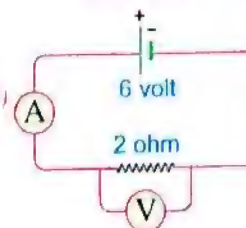
32. The ohmeter is used to measure .... in the electric circuit. *(Sohag, South Sinai 2018)*

33. Ohm's law indicates the relation between .... , ... and ....

34. The potential difference between the two terminals of a conductor is .... proportional to the intensity of the current passing through it at a constant temperature.
(Qena 2018 , 2021)

35. The electric current intensity passing through a conductor is .... proportional to the resistance of a conductor and .... proportional to the potential difference between the two terminals of a conductor. *(Red Sea 2018)*

36. In the opposite figure : - The reading of voltmeter = ...
- The reading of ammeter = ... *(Giza 2019)*



37. The mathematical formula of Ohm's law is R = $\frac{\text{..........}}{\text{..........}}$

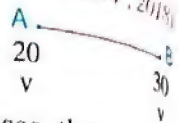
38. When a current of intensity 5 ampere passes through a conductor of resistance 2 ohm, so the potential difference across its terminals equals ....

6. Fill in the empty boxes to complete the table :

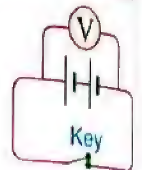
Conductor	Potential difference V (volt)	Current flow in conductor I (ampere)	Resistance of conductor R (ohm)
A	1.5	0.25	..........(a)..........
B	3.0	..........(b)..........	2
C	..........(c)..........	0.60	6.0

7. Give reasons for :

1. The electric energy is the cleanest source of energy.
2. The electrons still rotate around the nucleus.
3. In the electric circuit, the ammeter is connected in series.
4. The electric charges transfer from a charged conductor to another charged conductor. *(Fayoum 2014, 2018)*
5. The electric current is not transferred from a conductor its electric potential is 20 volt to another of 30 volt.



6. If the electric current intensity passing through the same conductor increases, then the potential difference across its terminals increases. *(Qalyoubia 2017)*
7. Electric current will not flow between two charged conductors have the same electric potential. *(Kafr El-Sheikh 2018)*
8. The voltmeter is connected between the two ends of a conductor.
9. 📖 The voltmeter is connected to the two poles of a battery. *(Port Said 2017 / Matrouh 2018)*
10. **In the opposite circuit**, when the key is opened, the voltmeter reading is not vanished. *(Qalyoubia 2019)*



11. Charging the mobile phone requires electric transformer.
12. 📖 Rheostat is used in some electric circuits. *(Assiut 2021 / Fayoum 2019)*
13. The resistance of sliding rheostat could be changed. *(Menofia 2015)*

8. Define each of the following :

1. The electric current. *(Alex. 2015 / Qena, Cairo 2018)*
2. The electric current intensity.
3. The ampere. *(Behira 2021 / Qena 2019)*
4. The coulomb. *(South Sinai 2014 / Cairo 2016 / Aswan 2018)*
5. The electric potential of a conductor. *(Port Said 2019)*
6. The potential difference between the two terminals of a conductor. *(Assiut 2016 / Matrouh 2018)*
7. The volt.
8. The electromotive force of a battery.
9. The electric resistance. *(Fayoum 2014)*
10. The ohm.
11. Ohm's law. *(Suez 2016)*

9. What is meant by each of the following ...? *(Dakahlia 2021 / Cairo 2019)*

1. An electric charge of 20 coulomb flows through a cross-section of a conductor in 5 second.
2. The current intensity flowing through a conductor is 2 ampere. *(Red Sea 2016)*

3. The electric potential of a conductor. *(Cairo 2021 / Assiut 2019)*

4. The potential difference across two points of a conductor is 5 joule/coulomb.

5. The electromotive force of a car battery is 12 volt. *(Giza 2021 , 2019)*

6. The resistance of a conductor is 22 ohm, and the amount of electricity passing per second is 10 coulomb. *(Sohag 2019)*

7. The potential difference across a conductor of resistance 3 ohm is 6 volt.

8. The current intensity passing through a conductor of resistance 1 ohm is 5 ampere.

9. An electric current of 3 ampere flows through a conductor and the potential difference across its terminals is 15 volt.

10. The ratio between the potential difference between the two ends of a conductor and the electric current intensity passing through it = 20 volt/ampere. *(Behira 2019)*

10. Mention one function only for each of the following :

1. Ammeter. *(Dakahlia 2019)*
2. Voltmeter. *(Kafr El-Sheikh 2021)*
3. Ohmmeter. *(Red Sea 2018 / Aswan 2019)*
4. Sliding rheostat. *(El-Menia 2021)*
5. Electric transformer. *(Menofia, Ismailia 2018)*

11. What happens when ...?

1. Vanishing or decreasing the attraction force in the atom between the nucleus and the electrons in the outer level. *(Gharbia 2021)*

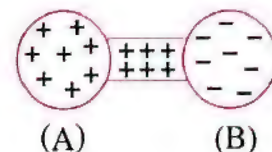
2. Increasing the quantity of electricity that passes through a cross-section of a conductor to the double at the same time. *(Matrouh 2017)*

3. The time of flowing the same amount of electric charges through a cross-section of a conductor is doubled. *(Luxor 2015)*

4. • Two electrically charged conductors are touched, where the electric potential of the first conductor is higher than that of the second. *(Behira 2021)*
   • Two charged conductors of different electric potential are touched. *(El-Menia 2021)*

5. Two conductors having the same electric potential are connected together by a wire. *(Gharbia , Damietta 2021)*

6. The electric potential at (A) is equal to that at (B) [according to the flow of the electric current through the conductor (AB) as shown in the opposite figure]. *(Giza 2021)*



7. Two charged conductors touch and the electric potential of the first conductor is 10 volt but the electric potential of the second conductor is 30 volt. *(Qalyoubia 2016 / New Valley 2018)*

8. The length of the rheostat wire increases in the electric circuit (according to the electric current intensity). (Fayoum 2018 / Damietta 2...)
9. The increase in the potential difference between the two ends of a conductor whose resistance is constant in a closed circuit. (Fayoum 2...)
10. The potential difference between the terminals of a conductor is doubled at constant temperature (for the current intensity passing through it).
11. Increasing the resistance of the rheostat in ohm's electric circuit (for the reading of both ammeter and voltmeter). (Sharkia 2...)
12. The ammeter and voltmeter readings used in verifying Ohm's law if the resistance is burnt. (Behira 2018 / Matrouh , Luxor 2...)
13. The electrons flow through the electric circuit. (Menofia 2...)

12. Compare between each of the following :

1. Voltmeter and ammeter to show the following : (Their uses, measuring units and the way of connection in the electric circuit). (Gharbia, Suez 2018 , Red Sea 2...)
2. Electric current and current intensity. (Menofia 2014 , Ismailia 2...)
3. Current intensity, potential difference and electric resistance (Concerning : definition - the apparatus used for measuring).
4. The unit of measuring the current intensity and the unit of measuring the potential difference (according to definition only). (Kafr El-Sheikh 2...)

13. Explain by drawing an activity :

1. To verify Ohm's law practically. (Fayoum 2...)
2. To determine the value of an unknown resistance.

14. Problems :

1. Calculate the electric current intensity that flows through a cross-section of a wire, if a charge of 5400 coulomb passes through in 5 hours. (Assiut , Suez 2...)
2. Calculate the current intensity due to the flow of 2400 coulomb in 5 min. through a cross-section of a conductor. (Cairo 2...)
3. Calculate the quantity of electricity that flows in a wire when an electric current of intensity 18 ampere passes for 7 minutes through this wire (conductor). (Suez 2017 , Sohag 2...)
4. Calculate the time needed to pass a charge of 25 coulomb through a wire if the current intensity which passes through it is 5 ampere.

5. If a charge of 20 coulomb passes through a cross-section of a conductor in 4 seconds. Calculate the current intensity that passes through this conductor. Then mention the name of the apparatus which is used in measuring the electric current intensity and its type of connection in the electric circuit.

6. Calculate the quantity of electricity that passes through a conductor of a resistance 2200 ohm for two minutes, if the potential difference between its terminals equals 220 volt. *(Gharbia 2021 / Qena 2019)*

7. A quantity of charge 360 coulomb passes in conductor through time of one hour, find the electric potential difference for the electric source if the resistance of the conductor is 2200 ohm. *(Dakhlia 2018)*

8. If the potential difference between the two terminals of a conductor is 6 volt, and an electric current of intensity 0.5 ampere passes through it. Calculate the intensity of the electric current passing through this conductor if it is connected to a voltage source of 12 volt. *(Qalyoubia 2016 / Port Said 2019)*

9. Calculate the work done to transfer an electric charge of 20 coulomb through a conductor, if the potential difference between its terminals (ends) is 50 volt. *(Giza 2018 , 2019)*

10. If an electric current of 2 ampere passes through a resistor of resistance = 100 ohm, calculate the work done to pass an electric charge equals 10 coulomb across the two ends of the resistor. *(Qalyoubia 2019)*

11. If the work done to transfer an electric charge of 300 coulombs between two points is 66000 joule, calculate the potential difference between the two points. *(Cairo 2019)*

12. If the work done to transfer a quantity of charge through a conductor equals 150 joule and potential difference across its terminals is 3 volt. Calculate the electric current intensity which passes in time equals 10 seconds in this conductor. *(Menia 2016)*

13. If the work done to transfer a charge of 300 coulomb between two points in a time equals 5 minutes is equal to 60 joule. Calculate : *(Luxor , New Valley 2019)*
(a) The electric current intensity. (b) The potential difference between the two points.

14. If the work done needed to transfer a quantity of electricity of 20 coulomb in a conductor equals 160 joule during 5 seconds. Find :
(a) The current intensity passing in the conductor.
(b) Resistance of a conductor. *(Menia 2019)*

15. 📖 Calculate the potential difference between the two ends of a vacuum cleaner whose resistance is 22 ohm and the current intensity passing through it is 10 ampere. *(Sohag 2018 / Giza 2021)*

16. Calculate the potential difference between the two ends of a vacuum cleaner whose resistance is 22 ohm and the quantity of electricity of 30 coulomb passes for one minute. *(Port Said 2015)*

17. If an electric current of 0.2 ampere passes in an electric heater and the potential difference between its two ends is 220 volt, calculate the heater's resistance. *(Aswan, Beni Suef 2018)*

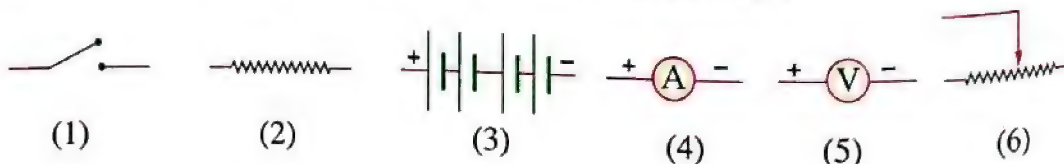
18. What is the quantity of electricity which passes through a conductor its resistance 1000 ohm for 30 minutes when the potential difference across its ends is 220 volt ? *(Fayoum 2021 / South Sinai 2017)*

15. Variant questions :

1. Show by drawing the method used for determination the potential difference between two terminals of an electric lamp.
2. Mention the two types of electric resistance (with drawing the symbol of each one).
3. Mention the physical quantity which is measured by the following units and the instrument used to measure it :
   (a) Joule / Coulomb.
   (b) Volt / Ampere. *(Menofia 2017)*
   (c) Coulomb / Second. *(Ismailia 2017)*
4. State the contributions of the scientist ohm.
5. • Draw the electric circuit used to verify Ohm's law, then state Ohm's law and its mathematical relation. *(Giza, Fayoum 2015 / Matrouh 2018)*
   • Draw the electric circuit used to deduce the relation between the intensity of an electric current passing through a resistance and the potential difference between its terminals, and write the labels on the diagram. *(Giza, Suez 2014)*
6. If you have a voltmeter , an ammeter , a switch , a fixed resistance , a rheostat , connecting wires and three electric cells connected in series : *(Alex. 2018)*
   (a) Draw an electric circuit to illustrate the relation between the current intensity and the potential difference.
   (b) If you knew that the e.m.f of each cell in the previous circuit is 2 volt, find the value of the fixed resistance if the reading of the ammeter was 6 ampere.
7. When the magnitude of the potential difference across the terminals of a conductor is equal to the magnitude of the electric current intensity passes through it. *(Menofia 2019)*

16. Study the following figures, then answer the questions :

1. Look at the following symbols, then answer the following :

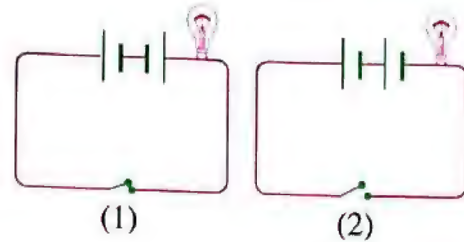


(a) What do the following symbols stand for ?

(b) Make a closed electric circuit using the items above to verify Ohm's law.

2. **Abdallah and Israa form two opposite circuits, but the lamps in the two circuits do not illuminate.**

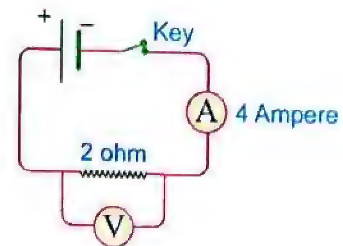
What is the wrong with each circuit, which prevents the illumination of the two lamps ?



(Qalyoubia 2014)

3. **In the figure :**

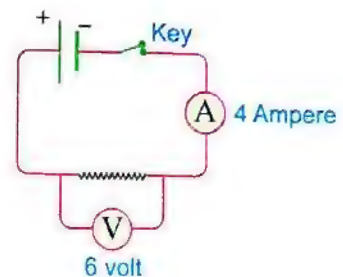
The voltmeter reading = ...



4. **In the figure :**

(a) The resistance value = ...

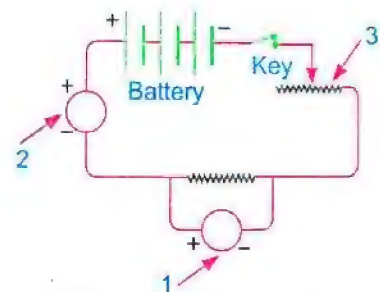
(b) The quantity of electricity passing in circuit through one minute. *(Giza 2016)*



5. **In this electric circuit name the digits that are referring to :**

(a) Device that used to control electric intensity.

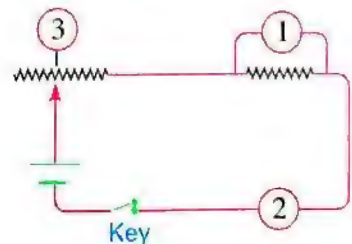
(b) Device which is connected in the electric circuit in parallel. *(Beni Suef 2018)*



6. **From the opposite figure which achieves Ohm's law, answer the following questions :**

(a) Write the labels (1) , (2) and (3)

(b) Write down the law used. *(Alex. 2014)*

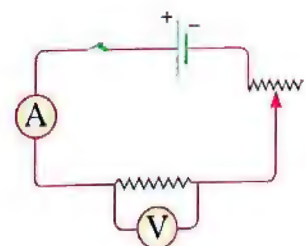


7. **Study the opposite figure, then answer :**

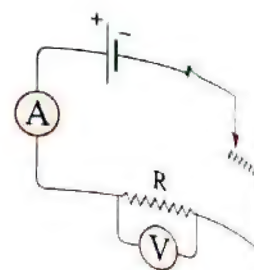
(a) How can you change (control) the current intensity passing through the circuit ?

(b) What is the method of connection of an ammeter and a voltmeter in this circuit ?

(c) If the current intensity is 0.2 ampere and the voltmeter reading is 4 volt. Calculate the value of the fixed resistance.



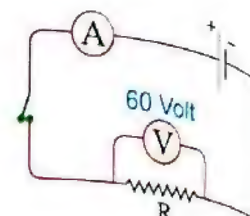
8. In the shown figure in front of you, if the reading of ammeter is 2 ampere, and the reading of voltmeter is 8 volt. Calculate :



(a) The value of resistance R.

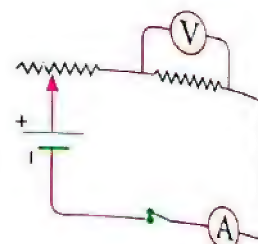
(b) The quantity of electricity passing through the circuit in one minute. *(Alex. 2021)*

9. In the opposite figure :



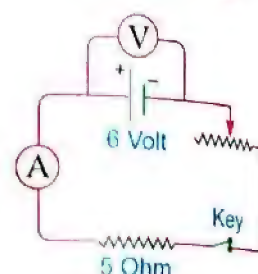
Calculate the current intensity passing, if the work done to transfer the electric charge is 540 joule and the time of flowing is 3 seconds. *(Sharkia , Dakahlia 2019)*

10. From the opposite figure :



If the reading of ameter in the circuit is 10 ampere and the reading of voltmeter is 210 volt.
Calculate the amount of constant electrical resistance, then mention the text of ohm's law. *(Assiut 2018)*

11. In the opposite figure which is represented by drawing :

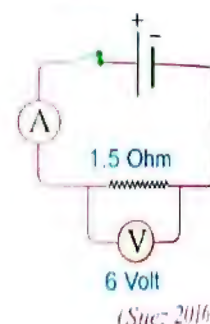


If the reading of the ammeter when the key is closed is one ampere and the electromotive force (e.m.f) of the electric cell is 6 volt, **calculate each of the following :** *(Qalyoubia 2016)*

(a) The potential difference between the two terminals of a resistance 5 ohm.

(b) The reading of the voltmeter when the key is open.

12. In the opposite figure :



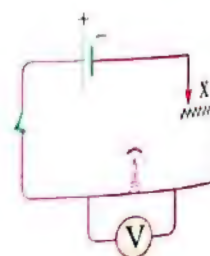
(Suez 2016)

(a) Calculate the ammeter reading.

(b) Does this reading increase or decrease with giving reasons for the following two cases ?

1. Using resistance (3) ohm instead of (1.5) ohm.
2. Using resistance (0.5) ohm instead of (1.5) ohm.

13. The opposite figure represents an electric circuit which contains lamp, the resistance of its filament is 10 ohm, if the electric current intensity passes through the lamp increases more than 0.1 ampere, its filament melts. If the reading of voltmeter is 5 volt, answer the following questions:



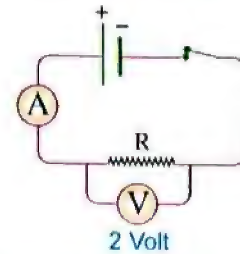
(a) Does the filament melt or not, why ? show this mathematically.

(b) What is the part (X) represents, and what is its function ? *(Qalyoubia 2017)*

14. If the quantity of electricity that passes through the electric circuit in the opposite figure through 60 sec. is 30 coulomb. Find : *(Ismailia 2016)*

(a) The reading of the ammeter (A).

(b) The resistance of the wire (R).



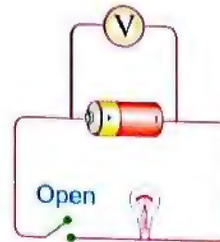
(Sharkia, Fayoum 2018)

15. In the following circuits :

(a)

The voltmeter is used to measure ....

(b)

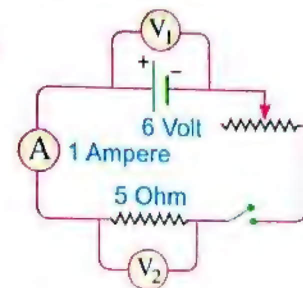


The voltmeter is used to measure ....

16. In the opposite electric circuit, find : *(Ismailia, Damietta 2017)*

(a) The reading of voltmeter (V_1) when the key is opened.

(b) The reading of voltmeter (V_2) when the key is closed.



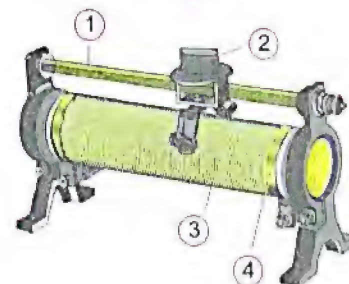
17. From the opposite figure : *(Fayoum 2014)*

(a) What is the name of this instrument ?

(b) Label the instrument. *(Assiut 2019)*

(c) What is its working idea ?

(d) How can it be used as a fixed resistance ?

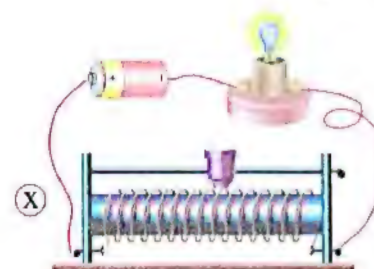


18. Study the opposite figure which represents an electric circuit :

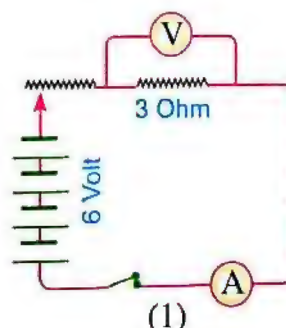
(a) What's the name of instrument (X) ? What's its use ?

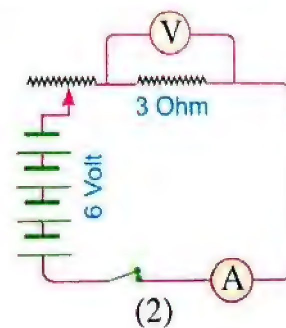
(b) What is its idea of operation ?

(c) Draw a diagrammatic figure for this circuit ?



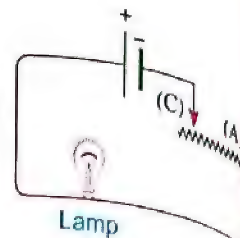
19. Compare between the reading of the voltmeter connected to the resistance in each of the following electric circuits (Giving a reason). *(Behira 2012)*





20. In the opposite circuit :

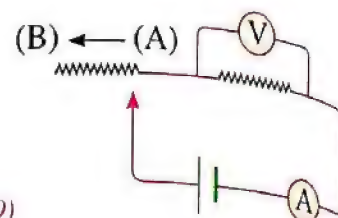
What happens to the illumination of the lamp, when the slider of the rheostat moves from point (C) to point (A) ? (Giving a reason).



21. In the opposite circuit, when the slider of the rheostat moves from (A) to (B) what would happen in the following ?

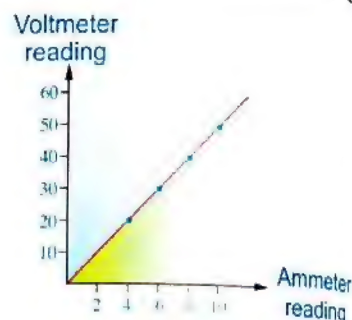
(a) The voltmeter and the ammeter reading ?

(b) The value of resistance (R). *(Qalyoubia 2019)*



22. Ahmed designed an electric circuit to prove Ohm's law practically. He wrote down the reading of ammeter and voltmeter, then he obtained the following graphic relation :

Voltmeter reading	20	30	40	50
Ammeter reading	4	6	8	10



(a) Find the value of constant resistance.

(b) Find the current intensity when the potential difference across the two ends of the fixed resistance is 25 volt.

23. Mention the physical quantity which is measured by each of the following units :

(a) Coulomb/Second. *(El-Menia 2018 / Suez 2019)*

(b) Joule/Coulomb. *(El-Menia 2018 / Suez 2019)*

(c) Volt/Ampere.

(d) Ampere.Second. *(Qalyoubia 2015)*

(e) $\frac{\text{Joule}}{\text{Ampere.second}}$ *(Behira 2015)*

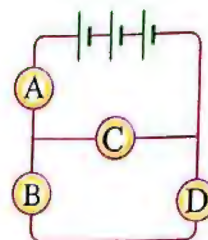
(f) Volt × Ampere × Second. *(Sharkia 2019)*

(g) $\frac{\text{Volt} \times \text{Second}}{\text{Coulomb}}$ *(Sharkia 2019)*

Thinking Skills Questions

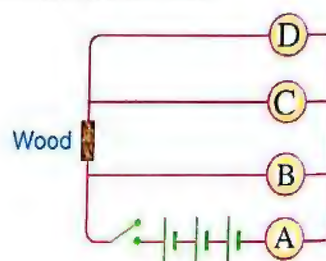
1. Choose the correct answer :

1. In the opposite figure of an electric circuit, when the bulb number .... is burnt, all lamps will put off.



a. A b. B c. C d. D

2. In the opposite electric circuit when we close the key, ... not illuminate.



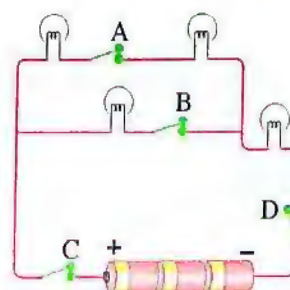
a. lamps A, B.

b. lamps C, D.

c. lamps A, B, C

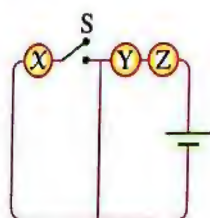
d. lamps A, B, C, D.

3. In the opposite electric circuit, when the switch .... is opened only two lamps are lighted.

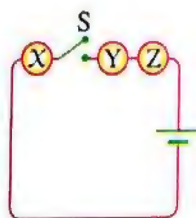


a. A b. B c. C d. D

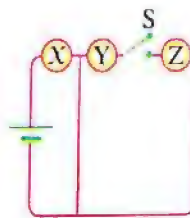
4. In which circuit, the two lamps "Y" and "Z" are illuminated while the lamp "X" is not illuminated ? ....



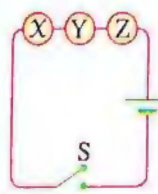
a.



b.

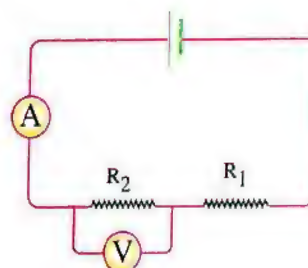


c.



d.

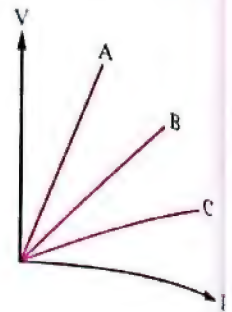
5. If we remove resistance (R_1) from the opposite electric circuit, the reading of ammeter and voltmeter will ....



a. increase. b. decrease. c. still constant.

6. The opposite figure shows the relation between potential difference and electric current intensity for 3 different wires, we show that, resistance of wire number .... is more than the other 2 wires. *(Behira 2016)*

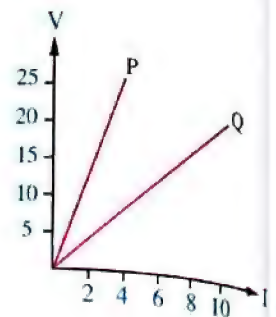
a. A　　b. B　　c. C



2. **The opposite figure represents the relation between the potential difference and the electric current intensity of two wires Q and P. They are made up of the same material and have the same cross-section.**

Which of the two wires has less length ?

Give a reason for your answer.



3. **In the opposite figure, determine the position of the connection of the clip on the resistance to obtain :**

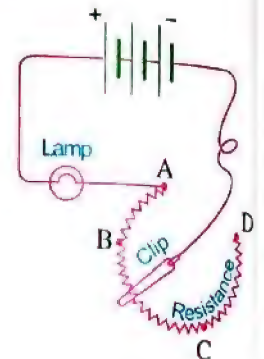
(a) The maximum illumination of the lamp.

(b) The maximum resistance in the circuit.

(c) The smallest current intensity flowing through the circuit.

(d) The highest current intensity flowing through the circuit.

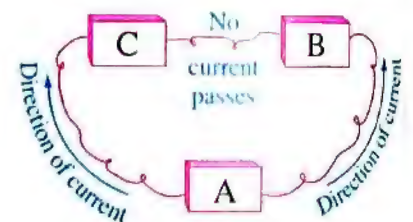
(e) The faintest illumination of the lamp.



4. **Study the opposite figure which represents three conductors are connected together through copper wires :**

(a) Mention the symbol of the conductor which has high electric potential.

(b) Why no current passes between conductors "C" and "B" ?



LESSON 2

Electric Current and Cells

What are the sources and types of the electric current ?

- You have known previously that electricity plays an important role in our daily life and the meaning of the electric current.
- In this lesson, we will identify some sources and types of electric current and methods of connecting the cells in the electric circuits.

Sources of the electric current

The electric current can be generated by two methods :

First

Electrochemical cells

Chemical energy is converted in the electrochemical cells into Electric energy

- **Electrochemical cells :**
  They are the cells in which the chemical energy is converted into electric energy.

Second

Electric generators (Dynamoes)

Mechanical (kinetic) energy is converted in the electric generator into Electric energy

- **Electric generators (Dynamoes) :**
  They are the devices in which the mechanical (kinetic) energy is converted into electric energy.

Examples

• Dry cells. • Batteries.

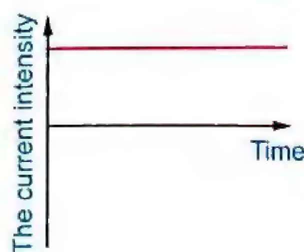
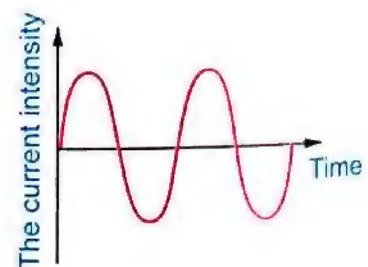
• Dynamo (**electric generator**).

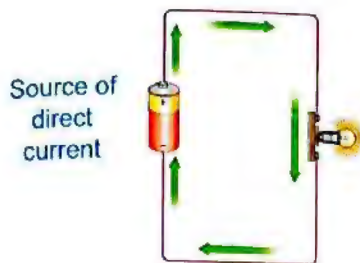
The type of the produced electric current

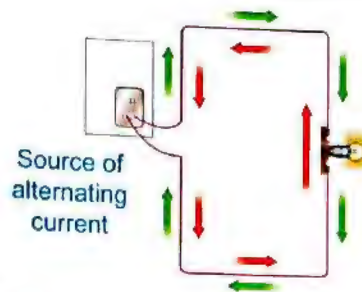
Direct electric current | **Alternating** electric current

Types of electric current

The electric current can be classified according to its direction and intensity in the conductors, into :

Direct electric current		**Alternating electric current**
Electrochemical cells such as dry cells and batteries	*Source*	Electric generators such as dynamoes.
It has a constant intensity.	*Intensity*	It has a variable intensity.
	*Graphical representation*	
It is unidirectional (It flows in one direction). [The electrons flow from one pole of the electrochemical cell passing through all the components of the circuit to the other pole].	*Direction*	**It is variable in direction.** [The electrons flow in one direction at the beginning, then starts to flow in the opposite direction and this cycle is repeated many times with high speed].





Transference

It can be transferred only for short distances.

It can be transferred for short and long distances through wires.

Change to another type

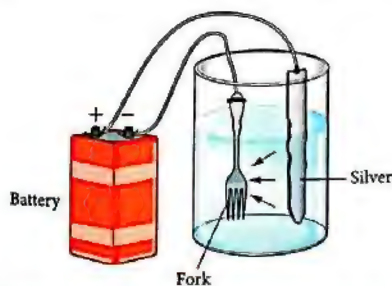
It cannot be converted into an alternating current.

It can be converted into direct current

Uses

- It is used in :
  - Electroplating processes.
  - Operating some electric appliances.

- It is used in :
  - Lighting houses and streets.
  - Operating electric appliances.



Painting a fork by a layer of silver

Definition

Direct electric current (D.C.)

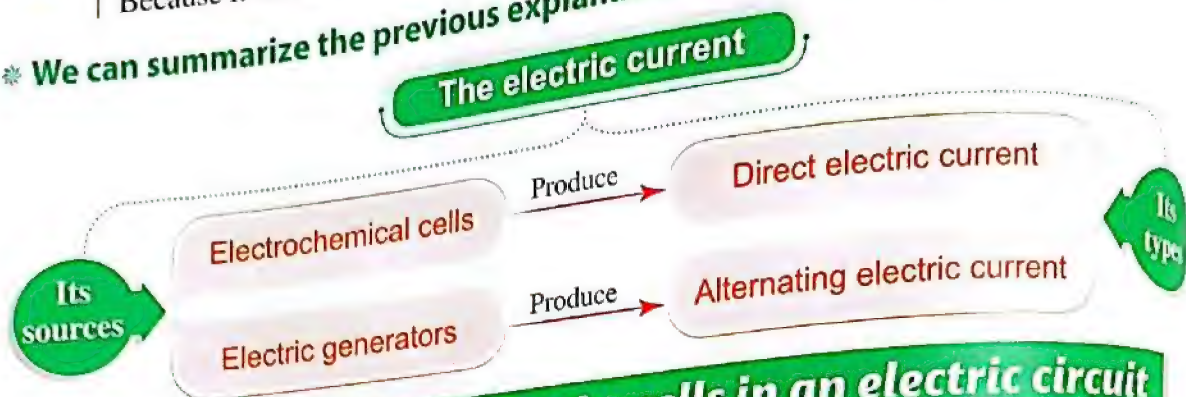
It is an electric current which has a constant intensity and flows in one direction in the electric circuit.

Alternating electric current (A.C.)

It is an electric current which has a variable intensity and flows in two opposite directions in the electric circuit.

G.R. | ***The alternating current is preferred to the direct current.***
Because it can be transferred for long distances and it can be changed into a direct current.

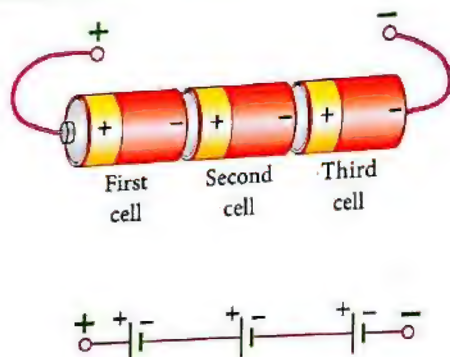
We can summarize the previous explanation in the following graph :



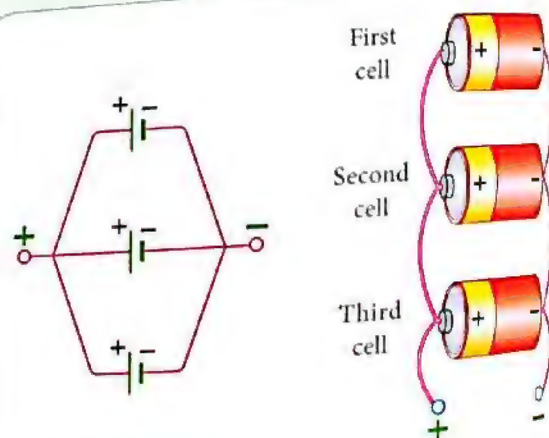
Methods of connecting the cells in an electric circuit

- Several electric cells connected together to form what is known by **a battery**.
- **There are two methods of connecting electric cells :**

1 Series connection



2 Parallel connection



The method of connection

The different poles are connected with each other as follows :

- The negative pole of the first cell with the positive pole of the second cell.
- The negative pole of the second cell with the positive pole of the third cell.

and so on ...

The similar poles are connected with each other as follows :

- The positive poles of all cells are connected together with one end to act as a positive pole.
- The negative poles of all cells are connected together with one end to act as a negative pole.

Therefore

The positive pole of the first cell and the negative pole of the third cell are the two poles of the battery.

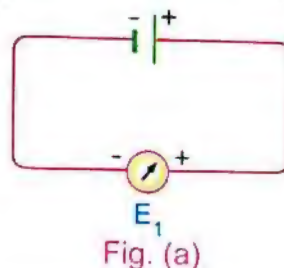
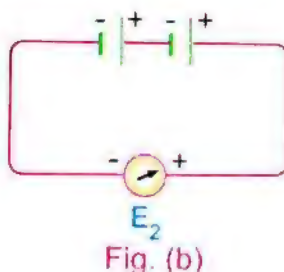
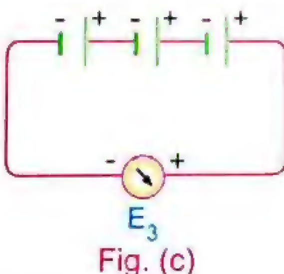
There will be one positive pole and one negative pole for the produced battery.

Note

The electric cell is represented by [−|+] two straight parallel lines, the longer one represents the positive pole and the shorter one represents the negative pole instead of the symbol

Measuring the electromotive force (e.m.f.)

Activity 1 The electromotive force (e.m.f.) of electric cells, when they are connected in series :

Procedures	Figures	Observations
1. • Connect a voltmeter to an electric cell of e.m.f equals 1.5 volt as shown in Fig. (a). • Record the reading of the voltmeter (let it be E_1).	 Fig. (a)	The reading of the voltmeter $(E_1) = 1.5$ volt
2. • Connect another similar cell to the first cell in series as shown in Fig. (b). • Record the reading of the voltmeter in this case (let it be E_2).	 Fig. (b)	The reading of the voltmeter $(E_2) = 3$ volt. i.e. **(E_2) is twice (E_1).**
3. • Connect another similar cell in series as shown in Fig. (c). • Record the reading of the voltmeter in this case (let it be E_3).	 Fig. (c)	The reading of the voltmeter $(E_3) = 4.5$ volt. i.e. **(E_3) equals three times (E_1).**

Conclusions :

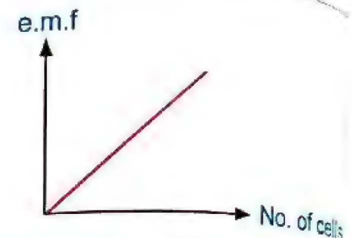
1. The electromotive force of a group of different dry cells connected in series = the sum of the electromotive forces of these cells.

$$\therefore E_{(battery)} = E_1 + E_2 + E_3 + \cdots$$

2. The electromotive force of a group of **similar** dry cells connected **in series** = the number of the cells (n) × the electromotive force of one cell.

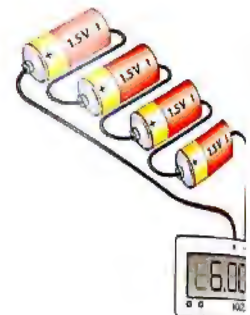
$$\therefore E_{(battery)} = n \times E_1$$

NB The relation between the electromotive force and number of similar electric cells connected in series can be represented by the opposite graph.



G.R. ***Some electric cells are connected in series in the electric circuit.***

To obtain a battery, its e.m.f is high.



Activity 2 The electromotive force (e.m.f.) of electric cells has same e.m.f, when they are connected in parallel :

Procedures	Figures	Observations
1. • Connect a voltmeter to an electric cell of e.m.f equals 1.5 volt as shown in Fig. (a). • Record the reading of the voltmeter (let it be E_1).	E_1 Fig. (a)	The reading of the voltmeter (E_1) = 1.5 volt.
2. • Connect another similar cell to the first cell in parallel as shown in Fig.(b). • Record the reading of the voltmeter in this case (let it be E_2).	E_2 Fig. (b)	The reading of the voltmeter (E_2) = 1.5 volt.

3. • Connect another similar cell to the previous cells in parallel as shown in Fig. (c).
• Record the reading of the voltmeter in this case (let it be E_3).

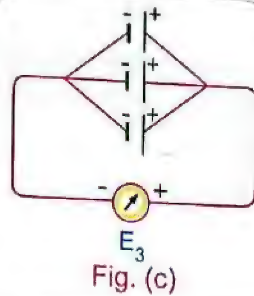


Fig. (c)

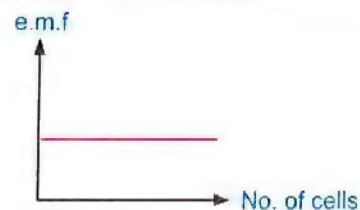
The reading of the voltmeter (E_3) = 1.5 volt.

Conclusion :

The e.m.f of a group of similar dry cells which are connected in parallel is equal to the e.m.f of one cell.

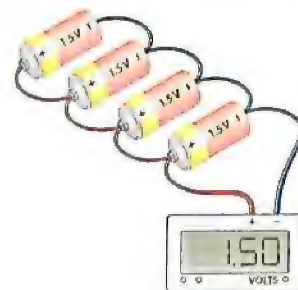
$\therefore E_{(battery)} = E_1$

NB The relation between the electromotive force and number of similar electric cells connected in parallel can be represented by the opposite graph.



G.R. ***Some electric cells are connected in parallel in the electric circuit.***
To obtain a battery, the e.m.f of it is low.

We connect dry cells in both series and parallel.
To obtain different values of e.m.f.



Comparison between the direct current and the alternating current :

The direct current	The alternating current
1. It is unidirectional and has constant intensity.	1. It is variable in both direction and intensity.
2. It is produced from electrochemical cells.	2. It is produced from electric generators.
3. It cannot be changed into an alternating current.	3. It can be changed into a direct current.
4. It cannot be transferred for long distances.	4. It can be transferred for long distances through wires.
5. It is used in electroplating processes and operating of some electric appliances.	5. It is used in lighting houses and operating electric appliances.

2 Comparison between the series connection and the parallel connection :

Points of comparison	The series connection	The parallel connection
The produced e.m.f :	• The (e.m.f.) of a group of similar dry cells connected in series is equal to the number of the cells (n) × the electromotive force of one cell. $E_{(battery)} = n \times E_1$ • It is used to obtain high (e.m.f.)	• The (e.m.f.) of a group of similar dry cells connected in parallel is equal to the (e.m.f.) of one cell. $E_{(battery)} = E_1$ • It is used to obtain low (e.m.f.)
The diagrammatic figure :	(series diagram: + − cells in a row)	(parallel diagram: three cells in parallel)

Guidelines to solve problems :

In some electric circuits, the battery is formed of many cells, some of them are connected in series and others are connected in parallel, so the e.m.f of the battery can be measured by the following relation :

The e.m.f of the battery = e.m.f of cells connected in series + e.m.f of cells connected in parallel

Problems

1 ***A battery consists of three cells, the e.m.f of each cell is 3 volt. Calculate the electromotive force if the electrodes are connected.***

(1) In series.

(2) In parallel.

Solution

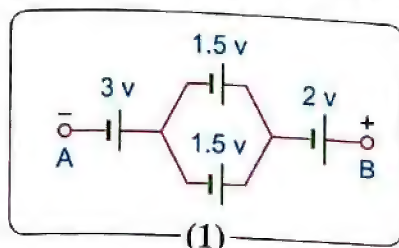
(1) Cells connected in series.

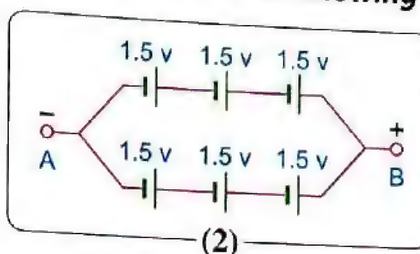
$E_{(battery)} = n \times E_1 = 3 \times 3 = 9$ volt.

(2) Cells connected in parallel.

$E_{(battery)} = E_1 = 3$ volt.

2 ***Calculate the e.m.f between the two terminals A and B of the two following circuits :***





Solution

(1) e.m.f of the battery = e.m.f of cells connected in series + e.m.f of cells connected in parallel

$= (3 + 2) + 1.5 = 6.5$ volt.

(2) • e.m.f of the first group of cells which are connected in series

$= n \times E_1 = 3 \times 1.5 = 4.5$ volt.

• e.m.f of the second group of cells which are connected also in series

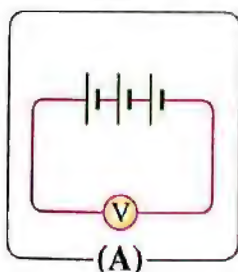
$= n \times E_1 = 3 \times 1.5 = 4.5$ volt.

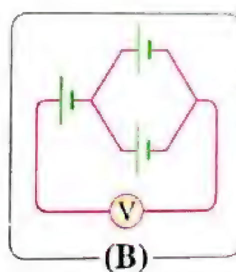
∵ The two groups are connected in parallel and e.m.f of each of them is equal.

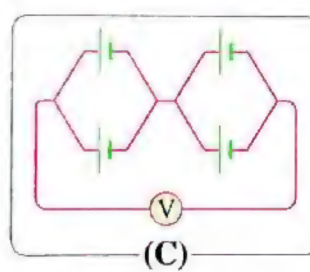
∴ e.m.f of the battery = e.m.f of one of them = 4.5 volt.

---

3 ***Mention the reading of the voltmeter in each of the following circuits. Knowing that e.m.f of each dry cell is 1.5 volt.***







Solution

(a) $E_{(battery)} = 1.5 \times 3 = 4.5$ volt.

(b) $E_{(battery)} = 1.5 + 1.5 = 3$ volt.

(c) $E_{(battery)} = 1.5 + 1.5 = 3$ volt.

Guidelines to solve problems on connecting of cells :

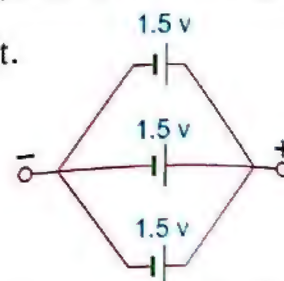
The method of connection of three similar cells with each other, the e.m.f of each of them = E volt.
(by knowing the e.m.f of the battery).

Example

Show by drawing the methods of connecting three similar cells, the e.m.f of each of them = 1.5 volt.
To obtain a battery its e.m.f equals :

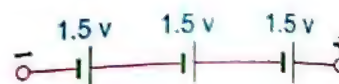
1. If the e.m.f of the battery = the e.m.f of one cell.
∴ All of cells are connected in parallel.

(1) 1.5 volt.



2. If the e.m.f of the battery > the e.m.f of one cell, and equals to the summation of the e.m.f of all cells.
∴ All of cells are connected in series.

(2) 4.5 volt.

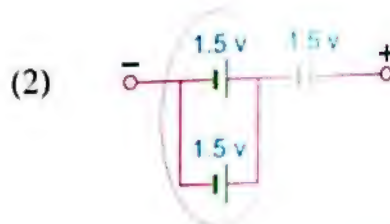


3. If the e.m.f of the battery > the e.m.f of one cell, and < the summation of the e.m.f of all cells.
The connection will be in two steps as follows :
(1) The cells are connected gradually in series until we reach the given value of e.m.f of the battery.
(2) The remain cell is connected in parallel with one of the cells which is connected in series.

(3) 3 volt.

(1)

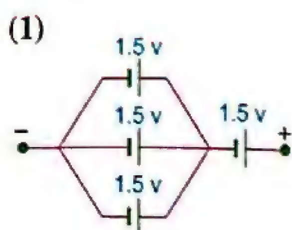
(2)



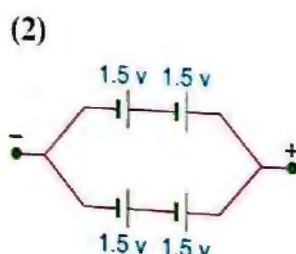
4 ***If you have 4 similar dry cells, the e.m.f of each cell is 1.5 volt. Show by drawing how to join them to get a new battery of e.m.f = 3 volt [in three different ways].***

Solution

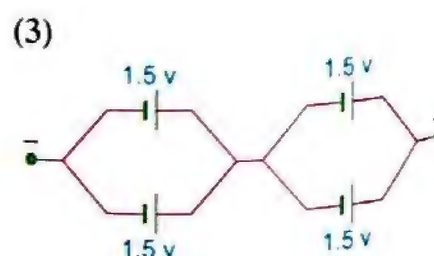
(1)



(2)



(3)

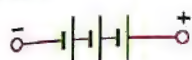


5 ***If you have 3 dry cells, the e.m.f of each cell is 3 volt. Show by drawing how to join them to get a new battery of:***

(a) Highest e.m.f. ***(b) e.m.f = 6 volt.*** ***(c) Lowest e.m.f.***

Solution

(a) To obtain a battery of high e.m.f, the cells are connected in series.

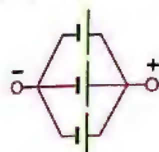


e.m.f = 3 × 3 = 9 volt.

(b) To obtain a battery of e.m.f = 6 volt., two cells are connected in parallel and both of them are connected in series with the third cell.

e.m.f = 3 + 3 = 6 volt.

(c) To obtain a battery of low e.m.f, the cells are connected in parallel.

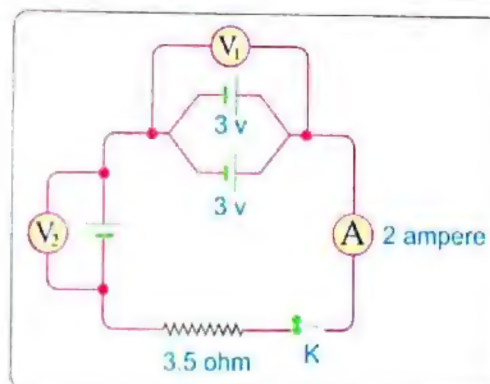


e.m.f = 3 volt.

6 ***In the opposite electric circuit, if the key (K) is opened. Determine the e.m.f which is measured by:***

(a) The voltmeter (V_1).

(b) The voltmeter (V_2).



Solution

(a) The reading of voltmeter (V_1) = 3 volt.

(b) ∵ Potential difference (V) = Resistance (R) × Current intensity (I)

= 3.5 × 2 = 7 volt.

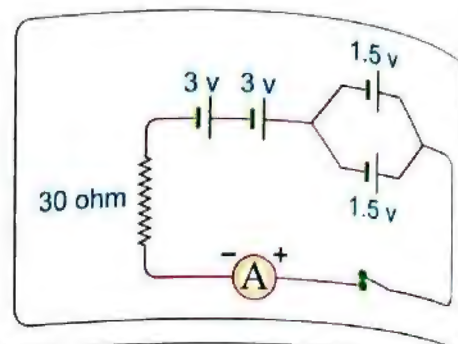
Note

The total potential difference (V) in the electric circuit is measured when the key is closed.

∴ The reading of voltmeter (V_2) = (V) – (V_1) = 7 – 3 = 4 volt.

Question

Calculate the electric current intensity passing through the opposite electric circuit.



Enrichment Activity

Activity **How series and parallel connection affect the current intensity in the circuit :**

Tools:

Fresh ripe lemons – 4 small ribbons of copper – 4 small ribbons of lead – copper wires - two small electric lamps.

Procedures:

1. Fix ribbons of both copper and lead and fix the wires.
2. Connect the circuits as in the figure (a) & (b).

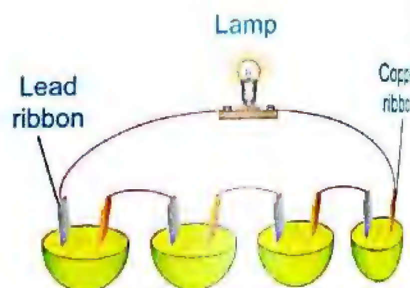


Fig. (a) Series connection

Observations:

- The light bulb illuminates in the two cases.
- The illumination in fig. (a) is stronger than that in fig. (b).

Explanation:

- The e.m.f of the battery in fig. (a) is (nE_1), which is larger than that of the battery in fig. (b) which is (E_1).
- This leads to increase the intensity of the electric current flowing through the circuit in fig. (a) more than that in fig. (b).

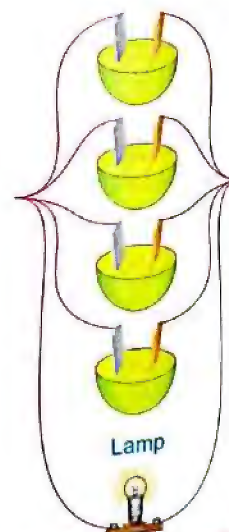


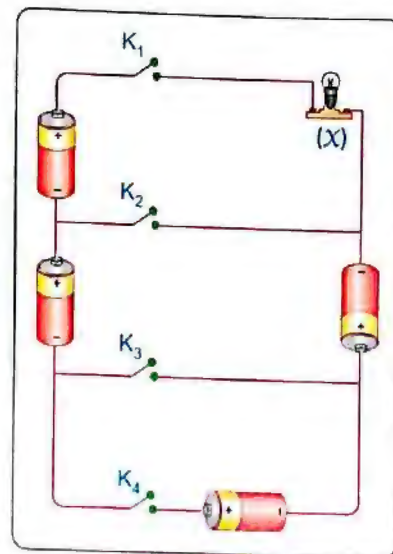
Fig. (b) Parallel connection

Conclusions:

1. The light bulb illuminates due to the electric current produced from the lemon.
2. As the electromotive force of the battery increases, the produced electric current intensity increases.

Exercise

The opposite figure represents 4 electric cells are connected to an electric circuit, lamp (x) and 4 keys (K_1, K_2, K_3 and K_4). How can you get a stronger illumination of the lamp (X) by the opening and closing of these four keys ? Explain your answer.



Answer

To get the stronger illumination of the lamp (X), the keys (K_1) and (K_4) must be closed and the keys (K_2) and (K_3) must be opened, because this leads to connecting the four electric cells with each other in series, which leads to increase in the total e.m.f of the battery, so the intensity of electric current passes increases.

TRY TO ANSWER worksheets in the Notebook **7&8**

Remember

Lesson Two

Electric current can be generated by two methods :

1. Electrochemical cells :

They are the cells in which the chemical energy is converted into electric energy.

2. Electric generators (Dynamoes) :

They are the devices in which the kinetic energy is converted into electric energy.

- Electric current produced from electrochemical cells (as dry cells) is known as dire **current**.
- Electric current produced from dynamo is known as **alternating current**.

Direct current:

Is constant in intensity and direction , can be transferred only for short distances, canno converted into an alternating current and it is used in :

- **Electroplating processes.**
- **Operating of some electric appliances.**

Alternating current:

Is variable in both direction and intensity, can be transferred for long distances, can b converted into a direct current and it is used in :

- **Lighting houses and streets.**
- **Operating electric appliances.**

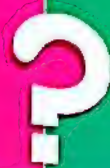
Types of connection of the electric cells in an electric circuit are :

1. Connection in series :

- The electromotive force of a group of different dry cells connected in series = the s of the e.m.f of these cells. $E_{(battery)} = E_1 + E_2 + E_3 + ...$
- The electromotive force of a group of similar dry cells connected in series = the no. the cells (n) × the electromotive force of one cell. $E_{(battery)} = n \times E_1$

2. Connection in parallel :

The electromotive force of a group of similar dry cells which are connected in parall equal to the e.m.f of one cell. $E_{(battery)} = E_1$

Questions  on lesson Two

Interactive Exercises

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

1. Choose the correct answer :

1. 📖 Direct current can be produced from .... *(Luxor 2016 / New Valley 2019)*
   a. electrochemical cells. b. electric generators.
   c. electric power stations. d. electric motors.
2. The instrument which is used to convert chemical energy into electric energy is ....
   a. electric cell. b. dynamo. c. motor. d. electromagnet.
3. From the examples of electrochemical cells is .... *(Alex. 2017)*
   a. ohmmeter. b. dynamo. c. dry cell. d. rheostat.
4. 📖 In the electric cell, the .... energy is converted into electric energy. *(Gharbia 2021)*
   a. kinetic b. magnetic c. chemical d. mechanical
5. 📖 The alternating current is used in ....
   a. lighting houses and streets. b. operating appliances.
   c. (a) and (b). d. electroplating processes.
6. 📖 One of the properties of the direct current is .... *(Aswan 2019)*
   a. change value. b. change direction.
   c. constant value and direction. d. change value and direction.
7. .... is used in electroplating process. *(Fayoum 2014 / New Valley 2017)*
   a. Electric generator b. Electric cell
   c. Electric motor d. Electromagnet
8. All of the following are from the properties of direct current except it ....
   a. is unidirectional. b. has constant intensity.
   c. can be transferred to short distances. d. can be converted to alternating current.
9. The electric current that is produced from the dynamo is ....
   a. an alternating current that cannot be converted into direct current.
   b. a direct current that can be converted into alternating current.
   c. an alternating current that can be converted into direct current.
   d. a direct current that cannot be converted into alternating current.
10. .... is used to produce direct electric current. *(Alex. 2021)*
    a. Dynamo b. Rheostat c. Ammeter d. Dry cell
11. To generate an alternating electric current, we use the ....
    a. dry cell. b. dynamo. c. dry battery. d. all the previous.
    (Cairo, Ismilia 2016 / Dakhalia, Suez 2018)
12. In dynamo, ... energy is converted into electric energy. *(Aswan 2018 / Qena 2019)*
    a. magnetic b. kinetic c. chemical d. light

13. All of the following are from the properties of alternating current except, it ....
 a. is unidirectional and has constant intensity.
 b. is variable in both direction and intensity.
 c. can be converted into direct current.
 d. can be transferred for long distances.

14. The alternating current is used in .... (Sohag 20..)
 a. electrolysis process.
 b. lighting houses.
 c. electroplating process.
 d. both (a) and (c).

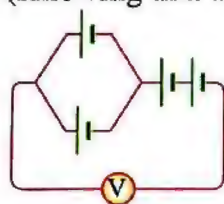
15. Alternating current is characterized by .... (Alex. 20..)
 a. constant intensity only.
 b. variable direction only.
 c. variable intensity and direction.
 d. variable intensity only.

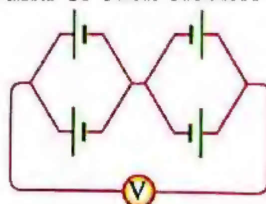
16. On connecting 5 electric cells, the e.m.f of each one is 2.5 volt in parallel, the total e.m.f of the new battery equals .... volt. (El-Menia 20..)
 a. 2.5
 b. 5
 c. 7.5
 d. 12.5

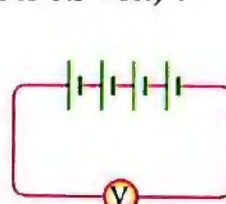
17. A group of similar cells which are connected in parallel makes a battery of e.m.f. ....
 a. greater than the e.m.f of one cell.
 b. equals to the e.m.f of one cell.
 c. smaller than the e.m.f of one cell.
 d. equals to the e.m.f of all cells.

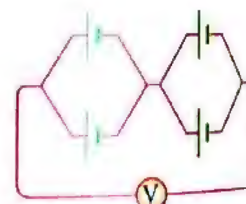
18. $E = n E_1$ is the law to get the e.m.f of ....
 a. one dry cell.
 b. similar cells connected in series.
 c. similar cells connected in parallel.
 d. a cell of e.m.f equals n.

19. In which of the following figures, the reading of the voltmeter is 3 volt? ....
(Knowing that the e.m.f of each electric cell is 1.5 volt) ?


a.

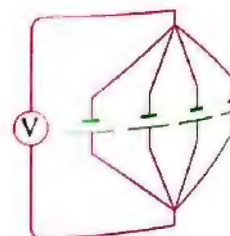

b.


c.

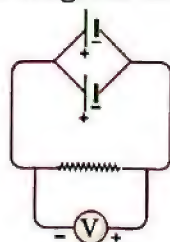

d.

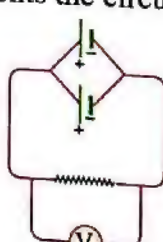
20. **From the opposite figure :**
The e.m.f of the battery equals .... volt.
 a. 4.5
 b. 3
 c. 1.5
 d. 6

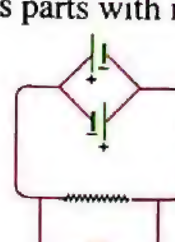
(Knowing that the e.m.f. of each cell is 1.5 volt).



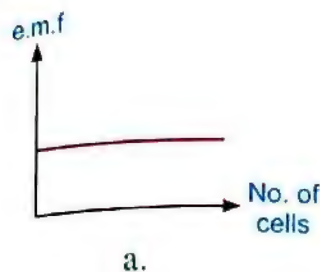
21. The diagram .... represents the circuit which its parts with right connection. (El-Menia 20..)


a.

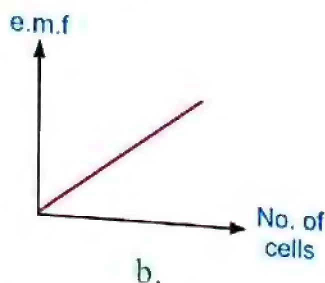

b.


c.

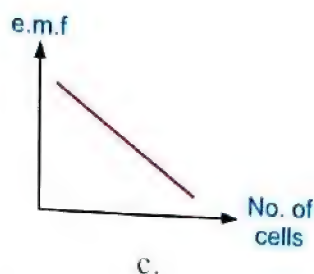
22. **From the following figures, choose :**



a.



b.

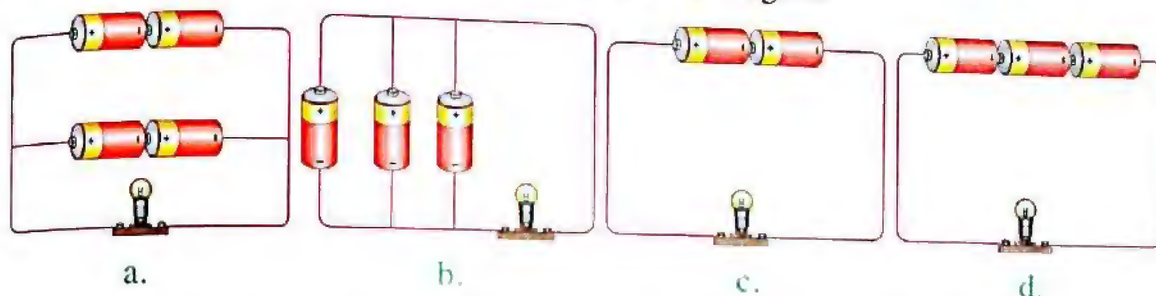


c.

(1) Fig. .... represents the connection of several similar cells in series.

(2) Fig. .... represents the connection of several similar cells in parallel.

23. The illumination of the lamp in circuit .... is the largest.



a. b. c. d.

2. Put (✓) or (✗) in front of each of the following statements and correct the wrong ones :

1. 📖 In electric cells and batteries, chemical energy is converted into electric energy. ( ) *(Menofia , Qena 2015)*
2. The current that is produced from dry cells is an alternating current. ( )
3. In dry cell, the magnetic energy is changed into electric energy. ( ) *(Fayoum 2014 / El-Menia, Suez 2018)*
4. In dry cell, mechanical energy is converted into electric energy. *(Sharkia 2018)* ( )
5. The direct current is unidirectional and has variable intensity. ( )
6. In the circuit of the direct current, molecules flow from one of the two poles to the other in the electrochemical cell. *(Alex. 2018)* ( )
7. 📖 Dynamo produces an alternating electric current. *(South Sinai 2016)* ( )
8. Alternating current is constant in both intensity and direction. *(Alex. 2014)* ( )
9. The electric generators convert mechanical energy into heat energy. ( )
10. In electric generator (dynamo), the heat energy converts into electric energy. ( ) *(Cairo 2018)*
11. Electric current in houses is always a direct current. *(Cairo, Qena 2014)* ( )
12. The direct current can be transferred for long distances. ( )
13. The alternating current can be converted into a direct current. *(Menofia 2021)* ( )
14. 📖 The e.m.f of several cells which are connected in series is equal to the e.m.f. of one cell. ( )

15. The electromotive force (e.m.f.) of several cells connected in parallel equals the electromotive force (e.m.f.) of one cell. *(Damietta 2021 / Qena 2018)* (
16. The e.m.f of a battery consists of (n) similar cells (each of them is E) connected in series is (nE). (
17. The electromotive force of three identical cells connected in parallel is twice the electromotive force of one cell. *(Giza 2018)* (
18. The electromotive force of several cells connected in series is equal to the electromotive force of them when they are connected in parallel. *(Menia 2014)* (

3. Write the scientific term of each of the following :

1. The device which can be used to convert the chemical energy into electric energy. *(Damietta 20..)*
2. The device which can be used to convert the mechanical energy into electric energy. *(Giza 20..)*
3. The electric current of constant intensity and direction. *(Cairo 20..)*
4. • An electric current which has variable direction and intensity. *(Beni-Suef 2021 / Sharkia 20..)*
   • The electric current which can be transferred through wires for long distances.
   • The electric current which can be changed to the other type of the electric current.
5. • The electric current which can't be changed to the other type of the electric current.
   • The electric current which is used in electroplating process. *(Behira 20..)*
6. • The electric current which is used in lighting houses and in operating washing machine
   • The electric current that is produced from converting the mechanical energy into electric energy by means of dynamo. *(Qalyoubia 20..)*
7. A type of connection of similar electric cells used to obtain high e.m.f. *(Giza 2021 / Sharkia 20..)*
8. A type of connection of electric cells used to increase the current intensity.

4. Complete the following statements :

1. The electric current can be generated by two types of devices, which are .... and ......
2. .... or .... are from electrochemical cells.
3. In electric cell (dry cell), ... energy is converted into electric energy. *(Behira , Gharbia 20..)*
4. The chemical energy is converted into electric energy by .... cell. *(Ismailia 20..)*
5. Electrochemical cells convert .... energy into .... energy. *(Gharbia 2016 / Sharkia 20..)*
6. There are two types of electric current which are .... and .... *(Aswan 20..)*
7. One of the properties of the direct current is .... *(Giza 20..)*
8. The electric current generated from a dynamo is due to the converting of .... energy into .... energy. *(Ismailia , North Sinai 20..)*
9. The electric current produced from electrochemical cells (batteries) is known as the .... current. *(Sharkia 2021 / Assiut 20..)*
10. Electric current produced form dry cell due to change the .... energy to .... energy. *(Dakhalia 20..)*

11. Electric cell produces .... current, while the dynamo produces .... current.

(Qena , Matrouh 2019)

12. .... current is unidirection and of constant intensity, while .... current is variable in both direction and intensity.

13. The .... current can be transferred for short distances only, while the .... current can be transferred for short and long distances.

(Damietta 2018 / Dakahlia 2019)

14. .... current can be converted into .... current.

15. There are two methods of connecting electric cells which are .... and ....

16. In series connection, the negative pole of the first cell is connected to the .... pole of the .... cell.

17. In .... connection, the positive poles are connected together, while .... poles are connected together.

18. The e.m.f. of a battery that consists of (n) cells connected in series and each of them of e.m.f (E_1) is ....

19. The e.m.f of a battery that consists of (n) cells connected in parallel and each of them of e.m.f (E_1) equals ....

20. Similar electric cells are connected in .... to obtain a high electromotive force and are connected in .... to obtain an e.m.f equals to one of them.

21. **Study the following figures (A) & (B) :**

(a) • In figure (A), the cells are connected in ....

• In figure (B), the cells are connected in ....

(b) In figure ...., the reading of voltmeter is larger.

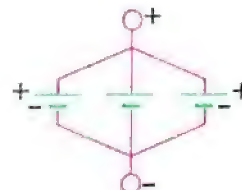


Fig. (A)

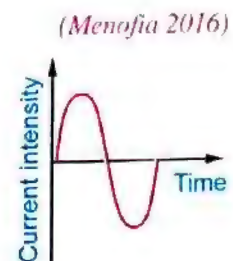
Fig. (B)

5. Give reasons for :

1. Electrochemical cells are called by this name.
2. Electrochemical cells are important in our life.

(Menofia 2016)

3. The opposite graph represents the alternative current. *(Alex. 2017)*



4. • It is better to use the alternating current rather than the direct current.

(Cairo , Dakahlia 2021)

(Suez 2018)

• Alternating current is preferred than the direct one.

5. The current produced from the electric generator is known as the alternating current. *(Menofia 201.)*

6. Electric current produced from electric generators is used in lighting and operating electric appliances.

7. Some electric cells are connected in the electric circuit in series. *(Red Sea 2018 / Qena 20.)*

8. Some electric cells are connected in the electric circuit in parallel. *(Alex. 20.)*

9. The electromotive force of a battery whose cells are connected in series is greater than that one whose cells are connected in parallel.

6. What's meant by ... ?

1. Electrochemical cells. *(Behira 2021 / Matrouh 201.)*
2. Direct electric current. *(Qalyoubia 2015 / Cairo, Menofia 201.)*
3. Alternating electric current.

7. Compare between :

1. Electrochemical cells and electric generators. *(Dakahlia 201.)*
2. Electric cells and dynamoes (regarding the change of energy in each). *(Cairo 202.)*
3. • The direct current and the alternating current (in view of definition, the field of using and the graph represent each type). *(Giza , Fayoum 201.)*
   • The direct electric current and the alternating electric current (concerning : the intensity and direction). *(Cairo, Sharkia, El-Menia 201.)*
4. Connection of cells in series and in parallel (in accordance with the resulted e.m.f). *(South Sinai 201.)*

8. What is the importance of each of the following ... ?

1. The dry cell. *(Luxor 2019)* 2. The dynamo.
3. Direct current. *(Red Sea 2019)* 4. Alternating current. *(Kafr El-Sheikh , Behira 202.)*

9. What is the idea of operation of each of the following ... ?

1. Electrochemical cells. 2. Electric generators.

10. What happens when .... ?

1. A group of electric cells are connected in series. (related to the e.m.f.)
2. A group of similar electric cells are connected in parallel. (related to the e.m.f.)

11. Show by drawing :

1. • A diagram representing the alternating current. *(Port Said 2014)*
   • Graphic representation of the alternating current. *(Matrouh 2018)*
2. A diagram representing the direct current.
3. An electric circuit containing 2 dry cells connected in parallel, voltmeter, ammeter and resistor (the voltmeter is connected in parallel with the obtained battery).
4. Connecting of three cells in series and also in parallel. *(Port Said 2015)*

12. Problems :

1. You have three similar cells, the electromotive force of each is 1.5 volt. Explain by using a diagram, how you can connect them to obtain an e.m.f of :
(a) 1.5 volt. (b) 3 volt.
(c) 4.5 volt.
(Giza, Kafr El-Sheikh 2017 / Assiut 2018)

2. A battery consists of three electric cells, the e.m.f of each cell is 1.5 volt. Calculate the e.m.f when the cells are connected : *(Cairo , Gharbia 2021)*
(a) In series.
(b) In parallel. (Write the used law in each case)

3. You have 4 similar electric cells, the electromotive force of each one is 1.5 volt. Illustrate by drawing how you connect them to get batteries of e.m.f of :
(a) 6 volt. *(El-Menia 2021 / Red Sea 2019)* (b) 4.5 volt. *(El-Menia 2021 / Red Sea 2019)*
(c) 3 volt in two ways. *(Port Said 2021)* (d) 1.5 volt. *(Port Said 2019)*

4. You have three electric cells, the e.m.f of each of them is (E) volts, show by drawing only how you can use them to get the highest e.m.f and how to use them to get the lowest e.m.f and mention the resulting e.m.f in each case.

5. If you have 4 dry cells, the e.m.f of each of the first and the second is 1.5 volt, the third is 2 volt and the fourth is 3 volt.
Explain by drawing how you can connect them to obtain a new battery of e.m.f equals :
(a) 8 volt. (b) 6.5 volt.

6. You have four similar electric cells, the electromotive force of each is 1.2 volt, show by diagram the method of connection together to obtain a battery its electromotive force equals :
(a) 1.2 volt. *(Luxor 2019)* (b) 4.8 volt. *(Giza 2014)*
(c) 2.4 volt. *(Luxor 2019)*

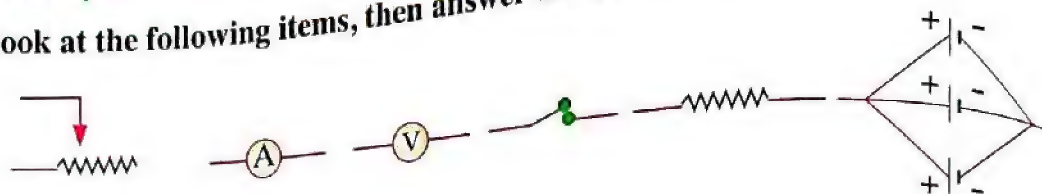
7. You have four electric cells, the electromotive force of each is 2 volt. Show by drawing only, how can you connect them to obtain a battery of an electromotive force of 4 volt with 3 different ways. *(Damietta 2018)*

8. You have 3 similar electric cells. The potential difference (e.m.f.) of each one is 2 volt. Show by drawing only, how you connect them to get batteries of e.m.f equals : *(Assiut 2019)*
(a) 2 volt. (b) 4 volt. (c) 6 volt.

9. There are three identical electric cells whose e.m.f = 6 volt are connected in the electric circuit by a certain method and total resistance = 4 ohm (Ω). Show by drawing and solving, how the circuit is connected to obtain current = 1.5 ampere.

13. Various questions :

1. **Look at the following items, then answer the questions.**



(a) Make a closed electric circuit.

(b) How can the current intensity in a circuit be controlled ?

(c) What is the type of connecting cells ?

(d) If the e.m.f of each cell is 2 volt. Find the value of total e.m.f.

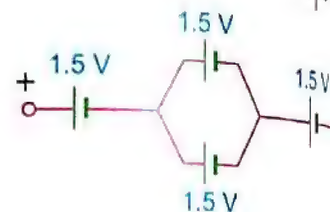
2. **The opposite figure shows three electric cells, the electromotive force of each is 1.5 volt which are connected together.** *(Qalyoubia 2016)*

(a) What is the type of connection of the cells ?

(b) Calculate the electromotive force for the battery ?

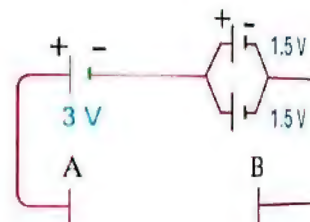
3. **At the opposite figure :**

Calculate the electromotive force (e.m.f.) of the battery. *(South Sinai 2018)*

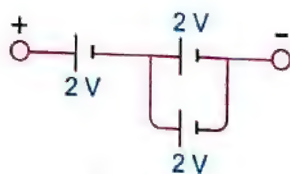


4. **Calculate the electromotive force between the two poles (terminals) A and B in this figure.**

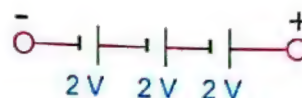
(Damietta 2017 / New Valley 2018)



5. **Look at the following figures, then answer :**



Circuit (1)



Circuit (2)

Calculate the total electromotive force in the two circuits ?

(Suez 2014 / Gharbia 2017 / Aswan 201?)

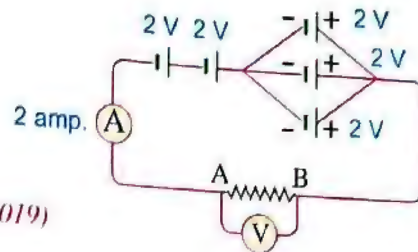
6. **Show by drawing only the methods of connecting three similar cells to obtain :**

(a) Largest e.m.f. (b) Smallest e.m.f. *(Damietta 201?)*

7. From the opposite figure :

Calculate the work done to transfer a quantity of electric charge between the two points (A) and (B) for 5 minutes.

(Menofia 2016 / Behira 2019)

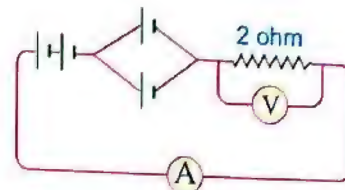


8. In the opposite figure :

If the electromotive force of each cell is 2 volt, find :

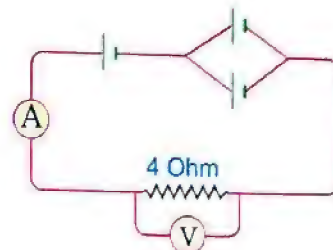
(a) The e.m.f of the battery.

(b) The reading of ammeter. *(Dakhalia, Behira 2017)*



9. In the opposite circuit,

You have 3 similar electric cells the e.m.f of each one is 3 volts, they are connected together as shown in the figure and a resistor of resistance of 4 ohm is connected with them, the potential difference between the two ends of the resistor is equal to total e.m.f of cells. Calculate the electric current intensity passing through the ammeter. *(Qalyoubia 2019)*

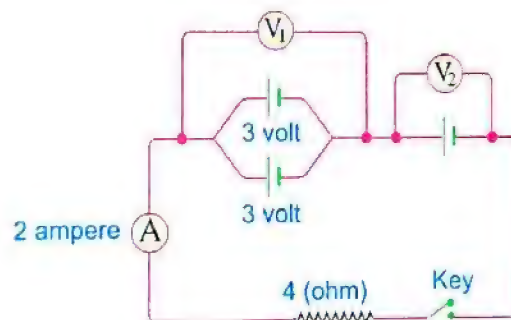


10. In the opposite electric circuit, Determine :

(a) The e.m.f in voltmeter (V_1) if the key is opened.

(b) The e.m.f in voltmeter (V_2) if the key is closed.

(Behira 2016)



11. In the opposite figure :

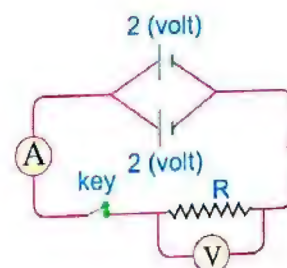
If the quantity of electricity which passes through the electric circuit in a time 40 seconds is 20 coulomb.

Find :

(a) The ammeter reading.

(b) The voltmeter reading.

(c) The value of resistance. *(Damietta 2016 / Behira 2018)*



12. In the opposite figure :

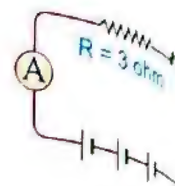
If the electromotive force of each cell is 2 volt.

Calculate :

(a) The electromotive force of the battery.

(b) The ammeter reading.

(c) If you want to prove Ohm's law practically, what are the apparatuses you should add to this electric circuit ?



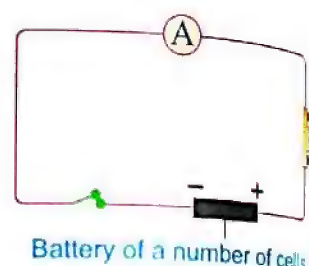
(Ismailia 2016 / Beni Suef 20..)

13. In the opposite electric circuit,

the ammeter reading is 0.1 Amper and the lamp resistance is 60 ohm and the e.m.f of each cell of the battery is 1.5 Volt. So,

(a) What is the least number of cells are needed to light the lamp,

(b) Draw the electric circuit in your paper showing how the cells are connected.

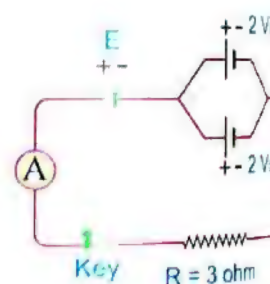


(Alex. 20..)

14. By using the given figure :

Calculate the electromotive force (e.m.f.) (E) of the cell knowing that the reading of the ammeter is (2 ampere) and the resistance is (3 ohm).

(Menofia 2019)



15. Study the following figures, then answer the questions below each one :

(Port Said 20..)

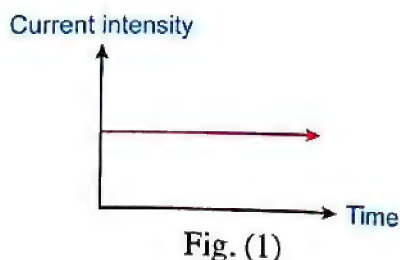


Fig. (1)

(a) The type of this current is ....

(b) This current is produced from ....

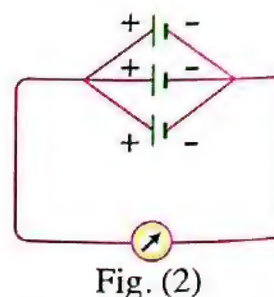


Fig. (2)

(a) The cells are connected in ....

(b) e.m.f of the battery = ...

16. In the following figures, there are two electric cells connected by two different ways in two electric circuits :

(Ismailia 2014 / Luxor 2016)

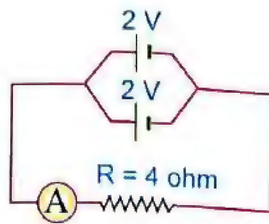


Fig. (1)

(a) The cells are connected together in ....

(b) The electromotive force (e.m.f.) = ... volt.

(c) The current intensity = ...

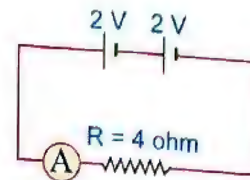


Fig. (2)

(a) The cells are connected together in ....

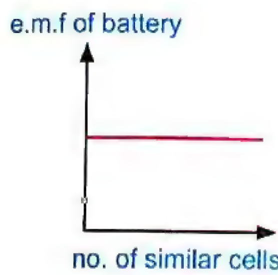
(b) The electromotive force (e.m.f.) = ... volt.

(c) The current intensity = ...

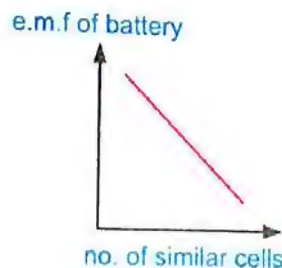
17. From the following graphs, determine :

(Matrouh 2017)

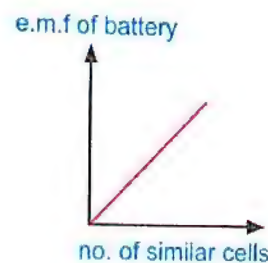
Which of them represents series connection and parallel connection ?



(A)



(B)



(C)

18. The following table represents the relation between the e.m.f of a group of electric cells and the number of these electric cells.

(Beheira 2018)

The number of electric cells	1	2	3	4	5
The e.m.f (Volt)	1.5	3	4.5	6	7.5

Answer the following :

(a) Draw a graphical relation between the e.m.f on Y-axis and the number of electric cells on X-axis.

(b) From the graph find the electromotive force of one cell.

(c) What is the type of connection of cells ?

19. Study the following two figures (1) and (2), then complete the spaces by suitable words :

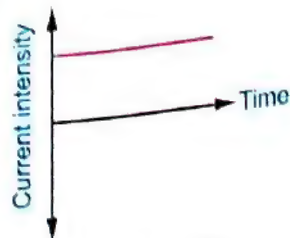


Fig. (1)

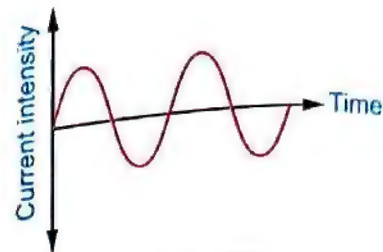


Fig. (2)

(a) Figure (1) represents .... electric current that produced from .... which changes .... energy into electric energy.

(b) Figure (2) represents .... electric current that produced by .... which changes .... energy into electric energy. *(Menofia 2..)*

20. From the two following figures, answer the following questions : *(Qalyoubia 2..)*

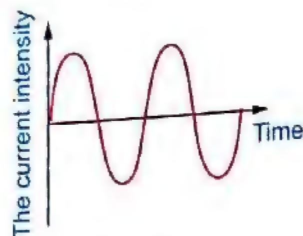


Fig. (1)

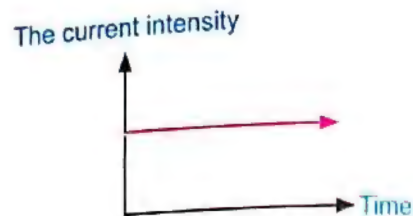


Fig. (2)

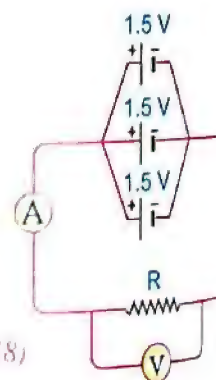
(a) What is the type of current in each figure ? *(Behira 20..)*

(b) How can you obtain each of them ? *(Behira 20..)*

(c) Mention the use of each current. *(Matrouh 20..)*

(d) Which of the two graphs expresses the current which is able to transmit for long distances ?

21. If a quantity of electricity which passes through the opposite electric circuit in a time 40 seconds is 20 coulombs. Find :

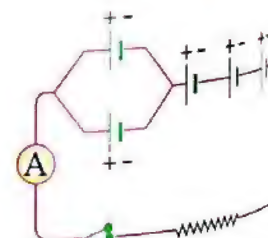


(a) The ammeter reading (A).

(b) The e.m.f of the battery.

(c) The resistance of the wire (R). [knowing that the reading of voltmeter is (1.5)]. *(Red Sea 2016 , 2018)*

22. In the opposite electric circuit, If the e.m.f for each cell equals 1.5 volt, and the value of the resistance equals 3 ohm, when the circuit is closed Calculate :



(a) The e.m.f of the battery.

(b) The reading of the ammeter. *(Aswan 2019)*

23. In the following two electric circuits, measure the ammeter reading :

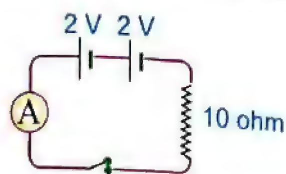


Fig. (1)

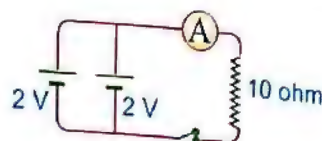
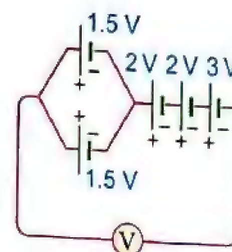


Fig. (2)

(Fayoum 2013)

24. From the opposite electric circuit :

What is the reading of the voltmeter ?

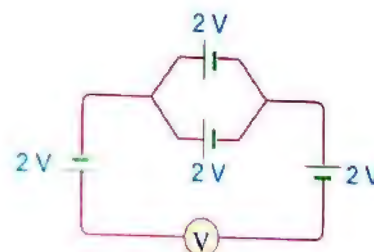


(South Sinai 2019)

25. In the opposite figure. Complete the following :

(a) Voltmeter reading = ... volt.

(b) If we connect all electric cells in series, the reading of voltmeter is .... volt.



(Damietta 2019)

26. The two following figures represent the relation between the no. of electric cells and the e.m.f Answer the following questions :

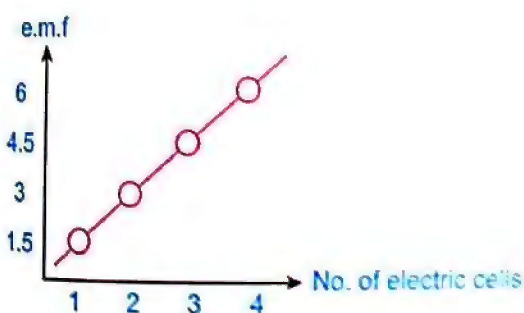


Fig. (1)

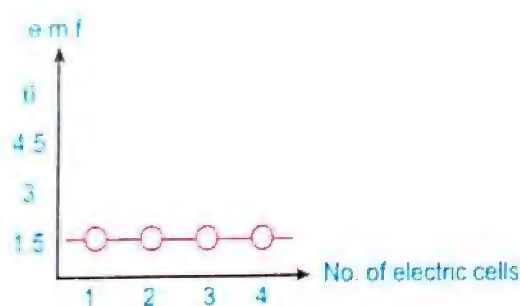


Fig. (2)

(a) Mention the type of connection in each figure.

(b) Find the total e.m.f in each case on connecting the four cells together.

(c) In which of the two ways, the current intensity is the largest ? *(Menofia 2015)*

27. Calculate the e.m.f of the battery in each of the following figures :

(Knowing that the e.m.f of each electric cell is 1.5 volt)

(Cairo, Suez 20..)

Fig. (1)

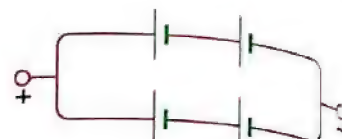


Fig. (3)

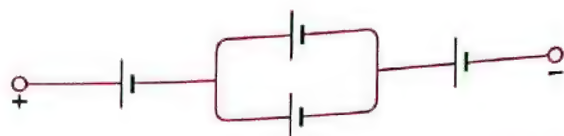


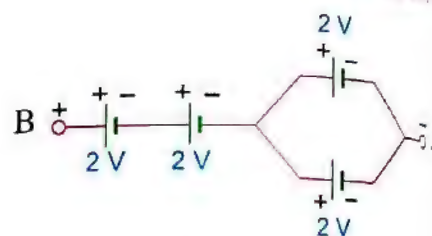
Fig. (2) *(Dakahlia 2016 / Red Sea 2017)*

28. The following figure represents a battery that contains four similar cells. The (e.m.f.) for each is 2 volt :

(Beni Suef 20..)

(a) Calculate the e.m.f between point (A) and point (B).

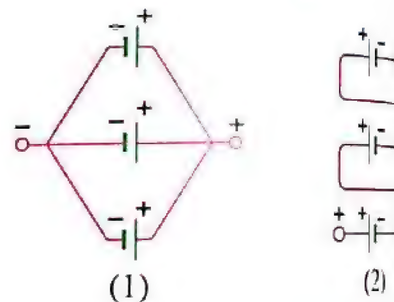
(b) By drawing only show how to connect electric cells of the battery to get maximum e.m.f.



29. From the opposite two figures :

Which figure gives higher voltmeter reading, when it is connected with battery (1) or when it is connected with battery (2) ? Why ?

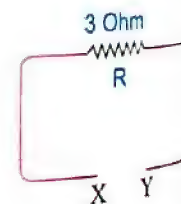
(Given that all the cells are similar).



(1) (2)

(Ismailia 20..)

30. You have four electric cells each cell has e.m.f = 3 volt. Show by drawing the method of connection of them in this circuit between points X and Y to obtain current intensity 3 ampere. Then find the quantity of charge passes in the resistance in half minute.



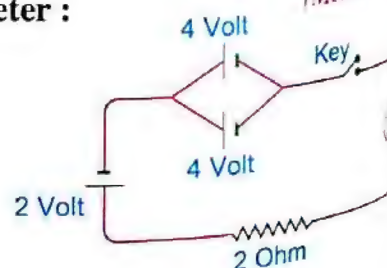
(Ismailia 20..)

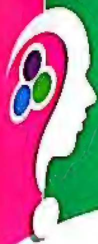
31. In this electric circuit calculate the reading of ammeter :

(Menia 20..)

(a) Before closing the key.

(b) After closing the key.





Thinking Skills Questions

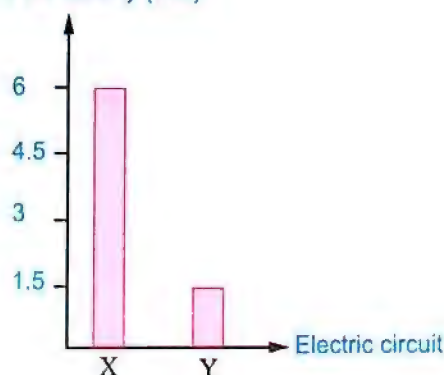
1. Show by drawing, how you can connect 3 electric cells, the e.m.f for the first and the second equals 1.5 volt, and the e.m.f for the third = 3 volt, to obtain a battery its e.m.f :

(a) 6 volt. (b) 4.5 volt. (c) 3 volt.

2. Calculate the number of the electric cells which form a battery whose e.m.f equals 9 volt. Knowing that it contains 2 cells only connected in parallel and the rest are connected in series and e.m.f of each cell equals 1.5 volt.

3. Look at the opposite graph:

This graph represents the e.m.f of 2 electric circuits X , Y each of them consists of a resistance = 10 ohm and a number of similar electric cells, e.m.f of each one 1.5 volt :



(a) Draw a diagrammatic figure for each circuit.

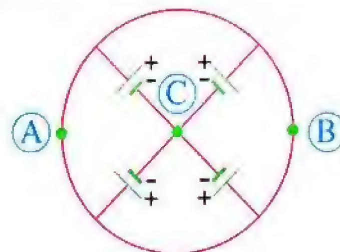
(b) Calculate the current intensity of each circuit.

4. Put (✓) or (×) in front of the following :

(a) Water is a good electric conductor because it is easily ionized into positive hydrogen ions and a negative oxygen ion. ( )

(b) Alternating current changes its direction at unequal time interval. ( )

5. In the opposite figure, which of the following answers, represent the right two poles of the battery ?

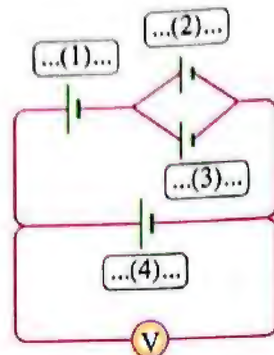


(a) Ⓐ and Ⓑ. (b) Ⓐ and Ⓒ.

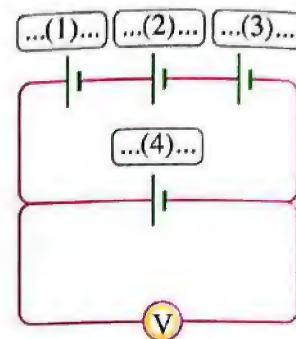
(c) Ⓐ and Ⓑ and Ⓒ. (d) no correct answer.

6. If you have 5 electric cells as follows :

Choose four cells from these electric cells to complete the following two circuits to ob
a voltmeter reading equals 4.5 volt in both circuits.



Circuit (1)

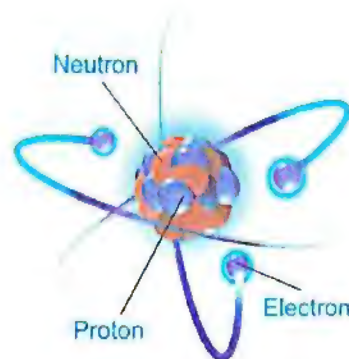


Circuit (2)

LESSON 3

Radioactivity and Nuclear Energy

What is meant by radioactivity ?



You have known previously that :

- All elements consist of atoms.
- The atom consists of a nucleus surrounded by electrons revolving around it in certain energy levels.
- The mass of the atom is concentrated in the nucleus which contains protons and neutrons.
- The composition of the atom is responsible for the physical and chemical properties of the element, where chemical reactions between atoms occur through their outermost electrons, while nuclear reactions occur due to the change in the number of protons and neutrons inside nucleus.

G.R. ***The mass of the atom is concentrated in the nucleus.***

Because the mass of electrons is negligible compared with the mass of protons and neutrons in the nucleus.

Nuclear energy

The nuclear energy is stored in the atom's nucleus.

✻ The origin of the nuclear energy :

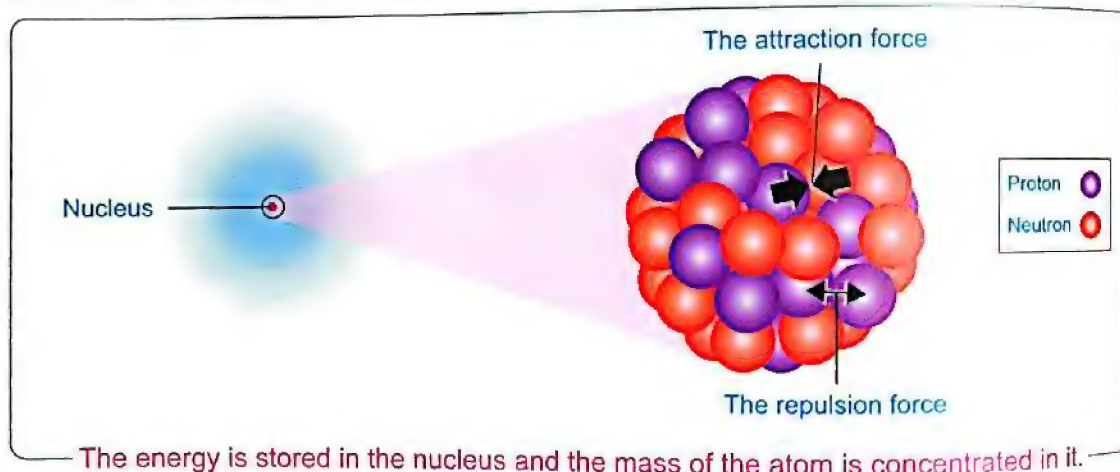
The nuclei of the atoms of the stable element are coherent although the presence of repulsion force inside them **G.R.**

Due to the presence of nuclear binding forces that are originated inside the nucleus, and acting on :

- Binding the nucleus components together.
- Overcoming the repulsion forces that are present between the positively charged protons and each others.

Nuclear binding forces :

They are the forces that are necessary to bind the nucleus components together and overcome the repulsion forces that are present between the positively charged protons and each others.



The energy is stored in the nucleus and the mass of the atom is concentrated in it.

The nuclear binding forces are considered as the source which provides the atom with a huge energy which is called the nuclear energy, so the atom's nucleus is considered as **the energy store**.

Radioactivity phenomenon

✻ The discovery of the radioactivity phenomenon :

- Radioactivity was discovered by a french scientist, Henri Becquerel in 1896.
- He discovered the emission of unseen rays from the uranium element, these rays have the ability to penetrate solid objects.

Henri Becquerel

• After that, he named these elements (as uranium) by "Radioactive elements" and this phenomenon by "Radioactivity phenomenon".

For illustration

What is meant by Radioactivity ?

In the periodic table, there are some atoms of elements, their nuclei have suitable number of neutrons that make them **stable**. But others have number of neutrons more than the number required for its stability that make them **unstable** due to its excess energy. And these elements are known as "Radioactive elements".

Radioactive elements :

They are elements whose atoms' nuclei contain a number of neutrons more than the number required for its stability.

Examples of some radioactive elements :

Therefore :

The atom's nuclei of radioactive elements emit : Invisible radiations as : Alpha particles, Beta particles, Gamma radiations automatically. **G.R.**

To get rid of the excess energy to acheive a more stable composition.

• This process is known as "Radioactivity phenomenon (natural radioactivity)".

Radioactivity phenomenon

Radioactivity phenomenon :

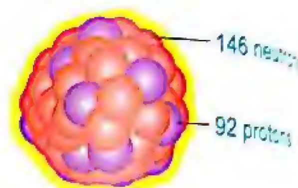
It is the spontaneous decay of the atoms' nuclei of some radioactive elements that are present in nature, in an attempt to achieve a more stable composition.

What happens if ...?

- **The number of neutrons in the atom of the nucleus of an element increases more than the number required for its stability ?**
  - ➲ Its energy will increase, so the atom's nucleus emit invisible radiation to achieve a more stable composition.

G.R.

- ***Uranium element is considered as a radioactive element.***
  Because its atom's nucleus contains a number of neutrons more than the number required for its stability, which leads to the presence of an excess energy that releases in the form of invisible radiation.



The atom's nucleus of the uranium 238

- ***The nuclei of radioactive elements are unstable.***
  Due to their excess energy because the number of neutrons more than the number required for its stability.

Artificial radioactivity

There is another type of radioactivity which is known as **artificial radioactivity** which is the radiation or nuclear energy that is released during nuclear reactions, which **either**:

Can be controlled	OR	Cannot be controlled
Like these which are done in **nuclear reactors** and are used in **safe uses**.		Like these which are done in **nuclear bombs** and are used in **military** uses.

Artificial radioactivity :

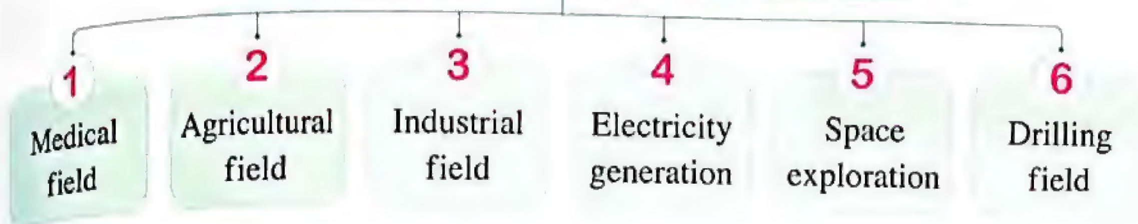
It is the radiation or nuclear energy that is released during nuclear reactions either from nuclear reactors or from nuclear bombs.

For illustration

- In the second world war, on August 6, 1945 an American aeroplane dropped the first atomic bomb on the Japanese city of Hiroshima, eventually killing over 140.000 people.
- On August 9, 1945 the United States of America dropped the second atomic bomb, this time on another Japanese city of Nagasaki, it killed 75.000 people.

The peaceful uses of nuclear energy

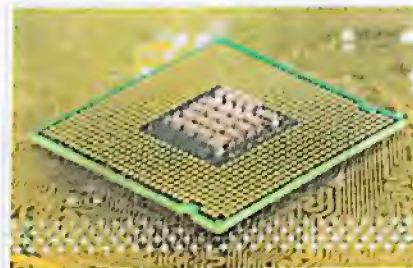
Scientists were interested in controlling the amount of energy released from nuclear reactions, therefore it can be used in peaceful uses in many fields, as shown in the following diagram :



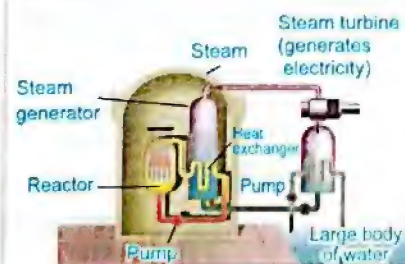
1 **Medical field :**
To diagnose and treat diseases like cancer.

2 **Agricultural field :**
To eliminate pests and to improve some plants races.

3 **Industrial field :**
- To convert sand to silicon sheets which is used in manufacturing computer processors and programmed electric circuits that are used in electric appliances.
- To discover defects in the manufactured products.



4 **Electricity generation field :**
To heat water to produce steam. This steam is used to operate turbines to generate electricity.



5 **Space exploration field :**
The radioactive materials are used as a nuclear fuel for rockets that fly in the space.

6 **Drilling field :**
Drilling for petroleum and underground water.

History

- Dr. Aly Mostafa Moshrafa is an Egyptian scientist, who was described by Einstein *(one of the greatest physicists in the world)*.
- Dr. Aly Mostafa Moshrafa has great theories in the fields of atom and radiation. Basics of manufacturing the atomic bomb were based on his theories.
- He gave his objection to the development of atomic bombs, and called for the necessity of exploiting the atom and radiation for the benefit of humanity.

Dr. Aly Mostafa Moshrafa

Radiation pollution

Radiation pollution :
It is the increase in the amount of radiation in the environment.

Sources of radiation pollution :

1 Natural sources :

They are represented by :
a. Natural radioactive materials found on the Earth's surface.
b. Cosmic radiation that comes from the outer space.

2 Artificial sources :

They take place due to :
a. The explosion of nuclear bombs that some countries do as experiments from time to time.
b. The nuclear reactors.

Example of radiation pollution :

The explosion occurred in the Russian reactor at Chernobyl.

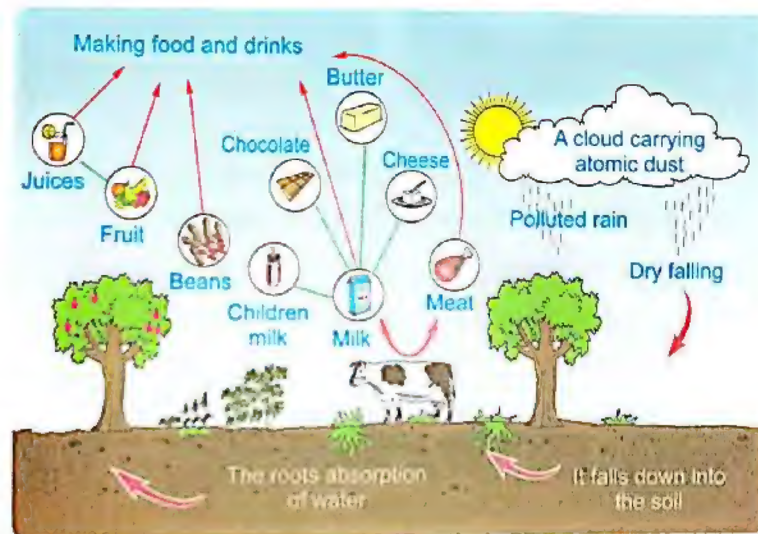
Chernobyl nuclear power plant

Time :
It occurs in 26th of April 1986.

Reason :
It occurs as a result of an error in operation.

Result :

- The melting of reactor core led to nuclear explosion and the release of many radioactive elements.
- These elements formed an atomic cloud.
- This polluted cloud was carried by the wind to many countries in Europe.
- When rain fell (in May), it carried radioactive elements to the Earth's surface.
- The plants and soil were polluted by the fallen radioactive elements (isotopes).



An image that illustrates the way by which food is polluted by radioactive elements

- Cows and sheep ate these plants. Their milk products and meat were polluted by radiation.

Isotopes :

They are atoms of the same element that contain the same number of protons and different number of neutrons.

G.R. ***The radiation pollution may be occurred in areas at which a nuclear explosion is not occurred.***
Because the radiation pollution may be transferred by the dry fallen through wind or by falling of rains to the Earth's surface.

Which of radioactive isotopes are found in polluted food ...?

- The elements that were found in the polluted food after the Chernobyl accident are iodine and cesium isotopes, they are produced from the decay of the nuclear fuel (Uranium-235) when absorbing the neutrons.

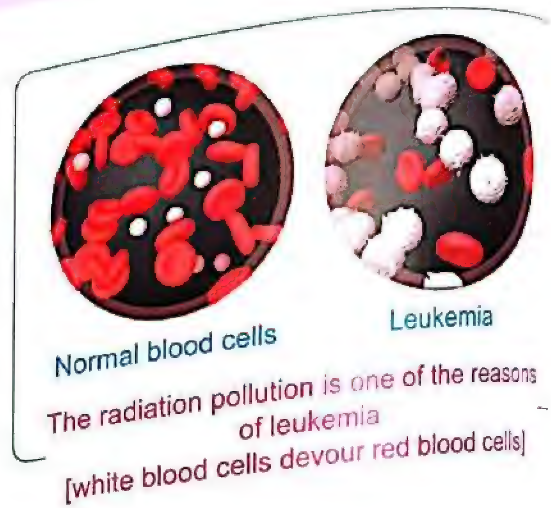
The radiation effects on the human body

- The effects of radiation on the human body differ in the amount of radiation and duration of the exposure to the radiation.
- These effects can be divided into two groups :

1 The effects due to exposure to a large dosage of radiation for a short time (one day or less) :

This will lead to the damage of :

- Spleen.
- Digestive system.
- Central nervous system.
- Bone marrow which is responsible for the formation of blood cells, so its damage will lead to the decrease in the number of red blood cells in the human body.



The radiation pollution is one of the reasons of leukemia
[white blood cells devour red blood cells]

Note

Bone marrow is the first which is affected by radiation.

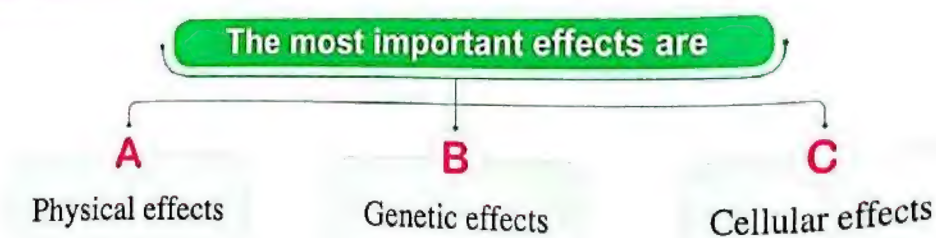
What happens when ...?

- **The number of red blood cells decrease in the human body ?**

This will lead to :

- Feeling of being sick.
- Sore throat accompanied by nausea, vertigo and diarrhea.

2 The effects due to exposure to a small dosage of radiation for a long time (months or years) :



A

Physical effects :

They are changes that appear on a living organism, as a result of exposure to radiation like skin cancer.

Skin cancer is from physical effects of radiation

B

Genetic effects :

They are changes in the sex chromosomes composition which result in abnormal birth.

Exposing to radiation causes genetic changes

C

Cellular effects :

They are changes in the cells composition which lead to destroy the cells.

For instance,
If the chemical composition of the hemoglobin changes, it becomes incapable of carrying oxygen.

Measuring the radiation

- The international measuring unit of nuclear radiation absorbed by the human body is the Sievert (SV).
- 1 milli Sievert = 10^{-3} Sievert

The safe dose when exposed to nuclear radiation :

- **The safe dose of nuclear radiation :**
  a. For radiologists (peoples work at nuclear radiation fields) is **20 milli Sievert per year.**
  b. For public is **1 milli Sievert per year.**
- **The safe dose of nuclear radiation depends on :**
  a. Age of the person.
  b. The period of time in which the person is exposed to nuclear radiation.
  c. The part of the human body that is exposed to nuclear radiation.

Means of protection from radiation pollution

Wearing gloves and protective clothes to protect against radiation

1. The workers with radioactive elements in labs and hospitals should wear radiation protective gloves, clothes and masks.
2. Follow the following precautions, while dealing with radioactive wastes :
   a. Radioactive wastes should be away from underground water path, to prevent its pollution.
   b. The area chosen for storing radioactive wastes should be a steady one (not exposed to earthquakes and volcanoes) and away from animals that live in caves **G.R.**

   To prevent the spreading of the radioactive wastes in the surrounding environment by the effect of earthquakes or volcanoes.
3. Burying of nuclear wastes according to the radiation power emitted from it :
   - Mild and moderate nuclear wastes, surrounded by a cement layer or rocks.
   - Strong nuclear wastes, buried deeply in the ground.
4. Issue laws for nuclear stations to cool the hot water before throwing it in seas and lakes.

Some wastes are placed deeply inside the Earth after surrounding it with a layer of cement or rocks

G.R. ***Some nuclear plants make artificial lakes for themselves.***
To throw their nuclear wastes in them.

▸ Enriching information

Nuclear explosions in bombs and atomic reactors cause radioactive contamination that causes serious damage to the environment, with effects lasting hundreds of years.

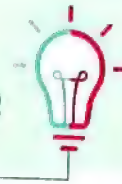
TRY To answer worksheet 9

- General Exercise of the School Book on Unit 2
- Model Exams on Unit 2

in the Notebook

Remember

Lesson Three



- **Nuclear energy :** is a type of energy originated in the atom due to the presence of nuclear binding force.
- **Radioactivity phenomenon :** was discovered by a French scientist Henri Becquerel.
- **Radioactive elements :**
  They are elements whose atoms' nuclei contain a number of neutrons more than the number required for its stability.
  Examples :
  Radium – Uranium – Cesium – Polonium – Rubidium – Selenium – Zirconium.
- **Radioactivity phenomenon :**
  It is the spontaneous decay of the atoms' nuclei of some radioactive elements that are present in nature in an attempt to achieve a more stable composition.
- **Artificial radioactivity :**
  It is the radiation or nuclear energy that is either released during nuclear reactions or nuclear bombs.
- **The peaceful uses of nuclear energy are :**
  A. In medical field.
  B. In agricultural field.
  C. In industrial field.
  D. In electricity generation field.
  E. In space exploration field.
  F. In drilling field.
- **Dr. Aly Mostafa Moshrafa has great theories in the fields of atom and radiation.**

Sources of radiation pollution are :

1 Natural sources

They are represented by :
- Natural radioactive materials found on the Earth's surface (radioactive elements).
- Cosmic radiation that comes from the outer space.

2 Artificial sources

They take place due to :
- The explosion of nuclear bombs that some countries do as experiments from time to time.
- The nuclear reactors.

- The international measuring unit of nuclear radiation absorbed by the human body is the Sievert (SV)

Means of protection from radiation pollution :

1. The workers with radioactive elements in labs and hospitals should wear radiation protective clothes.
2. Follow the precautions, while dealing with radioactive wastes.
3. Burying of nuclear wastes according to the radiation power emitted from it.
4. Issue laws for nuclear stations to cool the hot water before throwing it in seas and lakes

Questions on lesson Three

Interactive Exercises

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

1. Choose the correct answer :

1. The atom stores the nuclear energy in the .... *(Qalyoubia 2014)*
   a. nucleus. b. electrons. c. neutrons. d. protons.

2. 📖 The radioactive phenomenon was discovered by the scientist ....
   a. Ohm. b. Becquerel. c. Ampere. d. Volt.

3. .... is a radioactive element. *(Qena , Port Said 2019)* *(Kafr El-Sheikh 2018)*
   a. Calcium b. Radium c. Iron d. Barium

4. All the following are radioactive elements except .... *(South Sinai 2019)*
   a. radium. b. uranium. c. iron. d. cesium.

5. 📖 .... is a non-radioactive element. *(Suez 2018 / Aswan 2019)*
   a. Radium b. Uranium c. Zerconium d. Iron

6. .... is the scientist described by Einstein as one of the greatest physicists in the world. *(Behira 2016)*
   a. Ali Mostafa Mosharafa b. Ohm
   c. Mendel d. Henri Becquerel

7. Cosmic radiation is from .... sources of radiation pollution.
   a. natural b. artificial c. industrial d. medical

8. Nuclear energy liberated from radioactive materials is used in .... *(Beni Suef 2017)*
   a. medical field. b. electric generation field.
   c. space exploration field. d. all of the previous fields and more.

9. The nuclear energy is peacefully used in the industrial field to convert sand to .... for manufacturing computer processors. *(Gharbia 2021)*
   a. electric energy b. silicon sheets c. nuclear fuel d. atomic bombs

10. Improving of some plant races is from the uses of nuclear energy in the .... field.
    a. medical b. drilling c. industrial d. agricultural
    (Ismailia 2014)

11. Rockets use .... fuel for flying.
    a. gasoline b. kerosene c. natural gas d. nuclear

12. 📖 The .... effects of radiation is a result of changing the sex chromosomes of the cells.
    a. physical b. genetic c. cellular d. chemical
    (Assiut 2018 / New Valley 2019)

13. The changes in the sex chromosomes composition which results in abnormal birth is happened due to exposing to radiation doses .... *(Dakahlia 2016)*
 a. large for a long time. b. large for a short time.
 c. small for a long time. d. small for a short time.
14. The first which is affected by exposure to large dosages of radiation for a short time is .... *(Beni Suef 2019)*
 a. stomach. b. larynx. c. bone marrow. d. two lungs.
15. The damage of the spleen occurs due to exposure to .... *(Gharbia 2014)*
 a. large dosage of radiation for a short time. b. small dosage of radiation for a short time.
 c. large dosage of radiation for a long time. d. small dosage of radiation for a long time.
16. The measuring unit of the absorbed radiation is the .... *(Assiut 2021)*
 a. Curie. b. Sievert. c. Rontgen. d. Ohm.
17. Isotopes are atoms of the same element with different number of ....
 a. protons. b. electrons. c. neutrons. d. energy levels.
18. The .... effect of radiation is a result of changing the appearance of the living being.
 a. physical b. genetic c. cellular d. chemical
19. The .... effect of radiation is a result of the change in cells composition.
 a. physical b. genetic c. cellular d. chemical
20. The radiologist should not be exposed to radiation in amounts more than .... milli Sievert per year.
 a. 20 b. 5 c. 8 d. 1
21. The public should not be exposed to radiation in amounts more than ....
 a. 20 milli Sievert per year. b. 1 milli Sievert per year.
 c. 3 ampere. d. 4 volt.
22. Those who work with radioactive elements in laboratories and hospitals should wear radiation protective ....
 a. gloves. b. clothes. c. masks. d. all of the previous.
23. The nuclear wastes of strong radiation must be .... before they are deeply buried in the ground.
 a. heated b. cooled c. evaporated d. condensed

2. Put (✓) in front of the correct statements and (×) in front of the wrong ones and correct them :

1. The atom's proton is considered the nuclear energy store. *(Cairo 2013)* ( )
2. Electron is considered as an energy store in the atom. *(Fayoum 2018)* ( )
3. The radioactive phenomenon was discovered by the scientist Badel. *(Assiut, Qena 2018)* ( )
4. The radioactivity was known for the first time by the scientist ohm. *(Kafr El-Sheikh 2018)* ( )
5. The ionization phenomenon occurs in nuclei of radioactive elements. *(Fayoum 2014)* ( )

6. Unseen rays emitted from the uranium element can penetrate solid objects. ( )
7. Radium is one of the natural radioactive substances. *(Qalyoubia 2018)* ( )
8. The radioactive elements are unstable due to its excess nuclear energy. ( )
9. Natural radioactivity is the radiation produced from the stable elements present in nature. ( )
10. Nuclear reactions which are done in nuclear reactors can't be controlled. ( )
11. The sand is used in manufacturing of electronic circuits. *(Menofia 2014)* ( )
12. From the peaceful uses of nuclear energy in the medical field convert sand to silicon sheets. *(Assiut 2018)* ( )
13. The Chernobyl accident resulted in the pollution of food products by stable elements. ( )
14. Isotopes are atoms of the same element with different number of protons. ( )
15. The radiation effect on the human body differs with the duration of the exposure to the radiation. *(South Sinai 2012)* ( )
16. The first to be affected by nuclear radiation in human body is bone marrow. *(Sohag 2019)* ( )
17. Killing cancer cells is from the uses of nuclear energy in the medical field. ( )
18. We can generate electricity by using nuclear energy. ( )
19. The maximum safe doses of nuclear radiation for radiologist should not exceed 1 milli Sievert per year. ( )
20. The exposure to a large dosage of radiation for a short time leads to genetic effects. ( )
21. The digestive system is the first to be affected by the nuclear radiation. *(New Valley 2018)* ( )
22. The measuring unit of absorbed radiation is curie. *(Damietta 2015)* ( )

3. Write the scientific term of each of the following :

1. The energy stored in the nucleus and is liberated during nuclear reactions.
2. • The force that binds the nucleus components together.
   • The force that is needed to bind the nucleus components together and to overcome the repulsion force between the positively charged protons. *(Luxor , New Valley 2019)*
3. The elements, whose atoms' nuclei contain a number of neutrons more than the number required for its stability. *(Qalyoubia 2021 / North Sinai 2019)*
4. • The process of spontaneous decaying of atoms of some elements present in nature to reach a more stable composition. *(Giza , Alex. 2019)*
   • The spontaneous conversion of the nuclei of the atoms of some radiating elements that are present in nature to achieve a more stable composition. *(Giza , Dakahlia 2021)*
5. • The radiation and nuclear energy emitted during nuclear reactions that can be controlled and carried out at nuclear reactors. *(Sohag 2016 / Menia 2017 / Aswan 2018)*
   • The radioactivity that is released during nuclear reactions. *(Qalyoubia 2014)*
   • The nuclear energy that is either released during nuclear reactions done by the scientists that can be controlled or that cannot to be controlled. *(Dakhalia 2018)*
6. The increase in the amount of radiation in the environment. *(South Sinai 2021 / Luxor 2016)*

7. The radiation that comes from the outer space.
8. Atoms of the same element which have a different number of neutrons and have the same number of protons.
9. 📖 The changes that take place to the living organism due to its exposure to radiations. *(Gharbia 2018 / Sohag 2019)*
10. The changes in the cells composition as a result of exposure to radiation. *(Cairo 2021 / Menia 2019)*
11. 📖 The measuring unit of the absorbed radiation.

4. Complete the following sentences :

1. All elements consist of .... , and the atom's mass is concentrated in the ....
2. The composition of the atom is responsible for the .... and .... properties of the element.
3. The atom's nucleus is the .... and .... store.
4. The .... force is very strong and it holds the protons and the neutrons together inside the ....
5. The scientist who discovered radioactivity phenomenon is .... *(Giza , Behira 2019)*
6. Henri Becquerel discovered the emission of unseen rays from the .... element that has the ability to penetrate .... objects. *(Damietta 2017 / Gharbia 2019)*
7. Radioactive element are the elements whose atoms nuclei contain a number of .... more than the number that required for its stability. *(El-Menia , Beni Suef 2019)*
8. The atoms' nuclei of .... elements convert to nuclei of other elements more stable, this process is known by .... phenomenon.
9. .... , ... and cesium are natural radioactive elements.
10. The types of radioactivity are .... and .... radioactivity.
11. Artificial radioactivity that can be controlled is used in .... uses, while that can't be controlled is used in .... uses.
12. .... energy is used in the medical field to diagnose and treat some diseases like cancer. *(Beni Suef 2018)*
13. Nuclear energy can be used in peaceful uses in many fields such as .... , ... and industrial field.
14. Nuclear energy is used in medicine in .... and .... of some diseases. *(Qalyoubia 2016 / Port Said 2017)*
15. Nuclear energy can be used in agricultural field to .... and to improve .... *(Red Sea 2016 / Matrouh 2018)*
16. Nuclear energy is used to convert sand to .... sheets to be used in manufacturing of .... appliances. *(Gharbia 2017)*
17. The heat produced from nuclear reactors is used to produce steam, which is used to operate .... to generate ....

18. Radioactive materials are used as a nuclear .... for .... that fly in space.
19. Nuclear energy is used in the drilling of .... and underground ....
20. Radiation pollution is the increase of the amount of .... in the ....
21. Natural radiation sources are found on the .... and .... rays that comes from the outer space.
22. The radioactive elements that were found in the polluted food after Chernobyl accident are .... and .... isotopes.
23. Isotopes are atoms of the same number of .... and with different number of ....
24. The exposure to a large dosage of radiation for a short time leads to the damage of .... , ... and ....
25. The .... , genetic , and .... effects are due to the exposure to a small dosage of radiation for a long time.
(Behira 2018)
26. The .... effects of radiation is a result of changing the sex chromosomes of the cells.
(Gharbia 2021 / Giza 2019)
27. One of the cellular effects of radiation is that a change happens in the .... like the change of chemical composition of ....
(New Valley 2018)
28. The changes that appear on a living being is .... effects, while .... effects are the changes in the sex chromosomes composition due to exposure to a small dosage of radiation for a long time.
29. The measuring unit of absorbed nuclear radiation is .... *(Sohag 2021 , 2019)*
30. The maximum safe doses of absorbed nuclear radiation for a public, should not exceed .... per year.
31. Those who work with radioactive materials in laboratories and hospitals should wear radiation protective .... , ... and masks.
32. Radioactive wastes should be buried away from .... path and areas may be exposed to .... *(Damietta 2018 / New Valley 2019)*
33. The area chosen for storing radioactive wastes should be .... area, and not exposed to .... and ....
34. The nuclear wastes of weak and medium radiation are surrounded by a .... layer or .... and are placed deeply inside the ground. *(Qalyoubia 2014)*

5. Give reasons for :

1. The nucleus is the energy store. *(Assiut 2021 / Qalyoubia 2015)*
2. Binding the atom's nucleus although it has repulsion force.
3. The nuclei of radioactive elements are unstable. *(Qalyoubia 2014 / Matrouh 2018)*
4. 📖 Some elements are called radioactive elements. *(Menia 2018 / Aswan 2019)*
5. Uranium is considered from radioactive elements. *(Aswan , Gharbia 2018 / Red Sea 2019)*
6. 📖 Radioactivity has natural sources and also artificial ones.
7. Radiation pollution occurs.

8. Nuclear reactions are a source of radiation pollution.
9. Explosion of the Russian Chernobyl nuclear reactor.
10. 📖 After the Chernobyl accident, radioactive isotopes were found in the food products.
11. The exposure to a large dosage of radiation for a short time leads to decrease the number of red blood cells. (Aswan 2017 / Assiut 201
12. 📖 Radiation has genetic effects.
13. Radiation has cellular effects.
14. Workers with radioactive elements must wear radiation protective gloves, clothes and masks.
15. The radioactive wastes should be buried away from underground water's path. (New Valley 2017 / Sharkia, Beni Suef 20
16. 📖 The areas chosen for storing radioactive wastes should be steady. (Giza, Menofia 20

6. What is meant by each of the following ... ?

1. Nuclear energy.
2. Nuclear binding energy. (El-Menia 201
3. Radioactive elements.
4. • Radioactivity phenomenon. (... 2021 / Fayoum 201
   • Natural radioactivity.
5. Artificial radioactivity. (Assiut 2018
6. Radiation pollution.
7. Isotopes.
8. The Sievert.

7. Mention the use (or importance) of each of the following :

1. Nuclear binding energy.
2. Radioactive elements (in medicine). (Sohag ... 2014 / Sohag 201
3. Nuclear energy in :
   (a) Space exploration field. (Gharbia 201
   (b) Drilling field. (Aswan 201
   (c) Agricultural field. (Dakahlia , New Valley 2
   (d) Medical field. (Sohag 2019 / Red Sea 20
4. Nuclear energy in electricity generation field. (Kafr El-Sheikh 2
5. Nuclear energy in industry. (Aswan , Matrouh 2

8. Compare between :

1. Natural radioactivity and artificial radioactivity. (Damietta 2015 / Beni Suef 2
2. Nuclear reactors and nuclear bombs.

3. Natural and artificial sources of radiation pollution. *(Gharbia 2016)*
4. Physical, genetic and cellular effects produced from radiation. *(Sharkia , Damietta 2019)*

9. Various questions ?

1. What happens when ...?

(a) The atom's nucleus of an element contains a number of neutrons more than the number required for its stability. *(New Valley 2018 / Qalyoubia 2019)*

(b) Exposing a man for a large dosage of atomic radiation for a short period of time. *(Damietta 2021 / South Sinai 2019)*

(c) Exposure of the human body cells to radiation. *(Menofia 2016)*

(d) A chemical composition change in hemoglobin. *(Dakahlia , Ismailia 2019)*

2. (a) Under what conditions do the elements become naturally radioactive ?

(b) Compare between the uses of the controlled industrial radioactivities and uncontrolled industrial radioactivities. *(Qalyoubia 2018)*

3. Mention the discovery of radioactivity.

4. Mention the types of radioactivity.

5. State the contributions of the following scientists :

(a) Henri Becquerel. *(Suez , South Sinai 2014)*

(b) Dr. Ali Mostafa Mosharafa. *(Behira 2018)*

6. How can we produce electric energy from the nuclear energy ? *(Alex. 2012)*

7. Scientists were interested in finding safe uses of the nuclear energy. Name the most important of these uses in the industry field, electricity generation field and space exploration field. *(El-Menia 2019)*

8. Mention the name of the scientist whose : *(Kafr El-Sheikh 2012)*

Basics of manufacturing the atomic bomb were based on his theories, he gave his objection to the development of the nuclear bombs.

9. What are the sources of radiation pollution ? Mention two examples of each.

10. What are the effects of exposure to a small dosage of radiation for a long time? *(Menia 2019)*

11. The nuclear radiation has genetic effects. Explain this statement. *(South Sinai 2018)*

12. Mention three ways of protection from radioactive pollution. *(Suez 2012)*

13. Mention two precautions needed on dealing with radioactive wastes. *(Aswan 2014)*

14. What is the difference between the ways of removing nuclear wastes which have weak and strong radiation ? *(Ismailia 2014)*

Thinking Skills Questions

1. "In general, atoms can reach the stability by three different ways." (Explain)

2. Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Spleen.	a. physical effect of small dose of radiation.
2. Skin cancer.	b. destroyed by large dosage of radiation.
3. Presence of 6th finger in leg.	c. cellular effect of small dose of radiation.
4. Incapable of hemoglobin to carry oxygen.	d. genetic effect of small dose of radiation.

3. According to the opposite 2 figures :

(a) Which type of radiation (alpha – beta – gamma) has a negative charge ? Give a reason ?

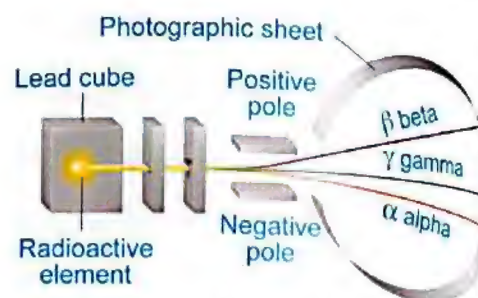


Figure (A)

(b) Which type of radiation has least power of penetration ?

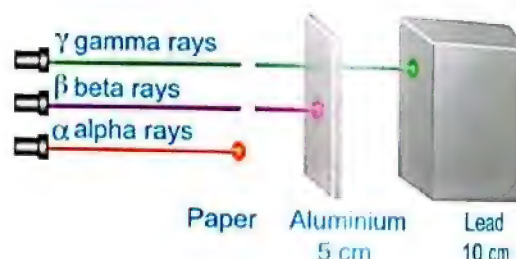


Figure (B)

4. Give a reason for :

The mass number of Uranium is 238.

Project
On UNIT TWO

A project to develop the analytical thinking
"Determining reasons and results"

* Complete the following table :

	Reasons	Results
1.	Ammeter is connected in an electric circuit.	....
2.	....	The electric current intensity is doubled.
3.	Increase of the work done to transfer an amount of electricity to the double, and decrease of the amount of electricity to the half.	....
4.	....	The electric charges transfer from one to the other.
5.	Decrease of potential difference between two ends of a conductor to half, with the constancy of temperature.	....
6.	....	Ability to control the electric current intensity which passes through different parts of the electric circuit.
7.	Insert two plates one of copper and the other of zinc in a potato fruit.	....
8.	....	The electromotive force of a battery increases as the number of connecting cells increases.
9.	Exposure to a large dose of radiation for a short period of time.	....
10.	....	Emission of invisible radiations from the nucleus to reach to a more stable state.

UNIT

3

Genes and Genetics

The Lesson | The Main Principles of Heredity.

Unit Objectives :

By the end of this unit, students will be able to :

- Determine the difference between the hereditary traits and acquired traits.
- Explain why Mendel chose the pea plant for his experiments.
- Identify Mendel's laws of heredity.
- Identify the concept of the dominant and recessive traits.
- Determine the dominant and recessive traits in Mendel's experiments on the pea plant.
- Identify some of the dominant and recessive traits in the human being.
- Identify the concept of the gene.
- Appreciate the efforts of geneticists in discovering how traits are transferred through generations.

THE LESSON

The Main Principles of Heredity

How are the hereditary traits transmitted from one generation to another ?

Genetics explains to us the existence of the similarities between you and your brothers or sisters as well as the differences in some external traits.
This is because genetic traits transfer from a generation to another according to basics and laws that geneticists reached.

※ Thousands of years ago, man has observed that :

Hereditary traits	Acquired traits
Some traits are transmitted from one generation to another, and scientists called them "Hereditary traits".	Some other traits are not transmitted from one generation to another, and are originated as a result of the experience gained by the individual from the environment in which he lives, and scientists called them "Acquired traits".

Hereditary traits

They are the traits that are transmitted from one generation to another.

Acquired traits

They are the traits that aren't transmitted from one generation to another.

Examples

- Hair colour.
- Skin colour.
- Number of fingers.
- The blood groups.

The inheritance of smoothness of hair and narrow eyes

- Skill of playing football.
- Learning of swimming.
- Speaking in many languages.
- Learning of walking in children.

Acquire the learning of walking

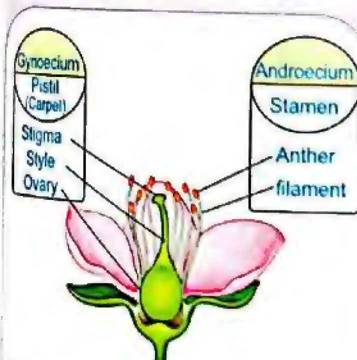
* The science which studies the hereditary traits and laws governing how they are transmitted is called "Genetics".

Genetics

It is a science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring.

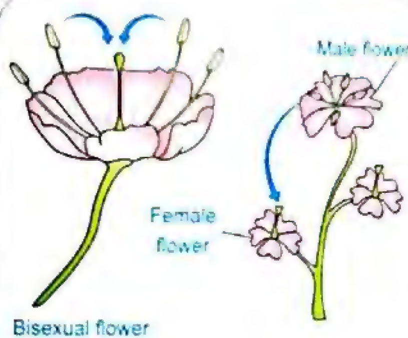
 # Important points were studied last year :

Hermaphrodite flower



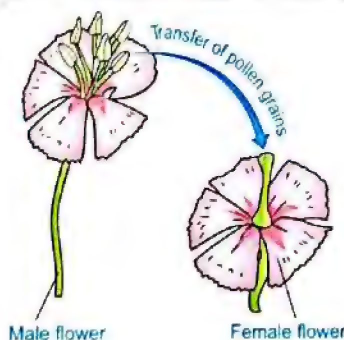
It is the flower that carries the male and female organs together.

Self-pollination



It is a process of transferring of pollen grains from the anthers of a flower to the stigmas of the same flower, or to another flower in the same plant.

Mixed-pollination

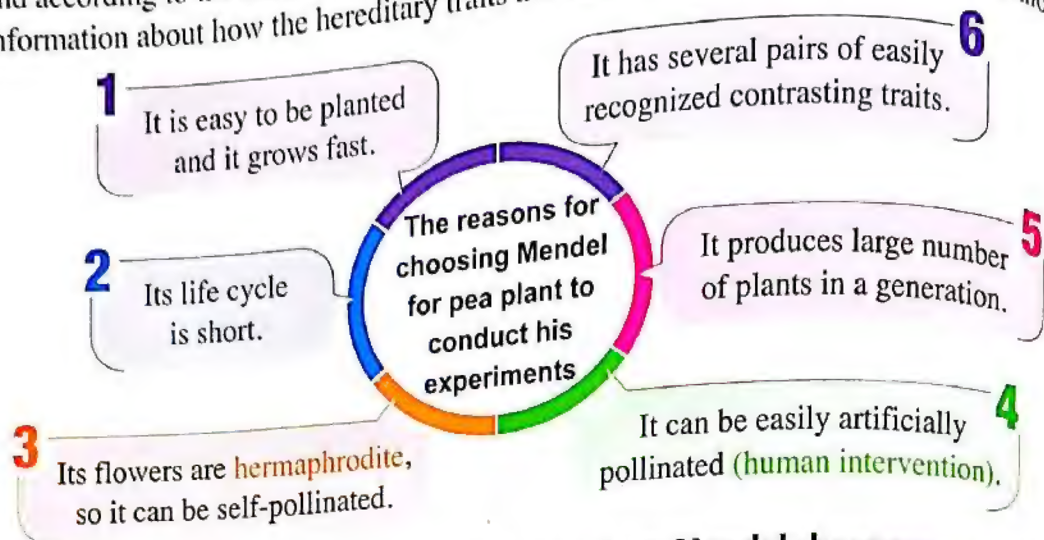


It is a process of transferring of pollen grains from the anthers of a flower to the stigmas of another flower in another plant of the same kind.

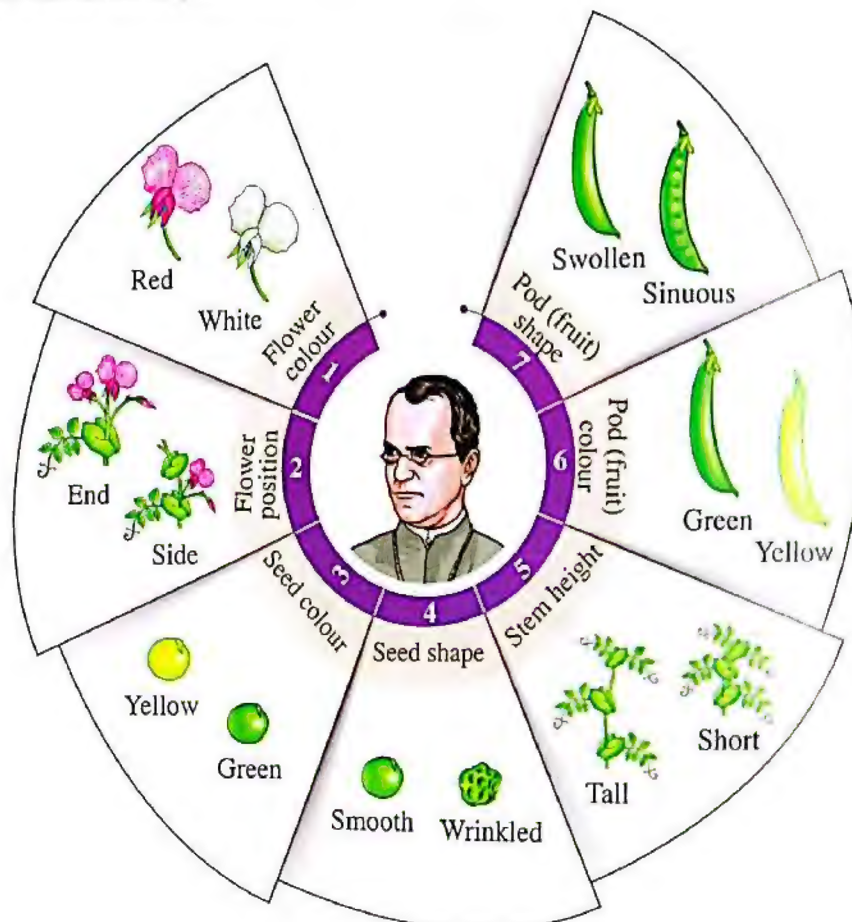
Mendel was the founder of heredity

- **The scientist Gregor Mendel** was the first founder of heredity **G.R.**

Because the scientific studies of heredity started with Mendel's experiments on pea plant and according to the results reached by Mendel, scientists of heredity have gathered a lot of information about how the hereditary traits are transmitted from one generation to another.



Despite the numerous different traits of pea plant, Mendel chose seven main traits to conduct his experiments which are shown in the following figure.



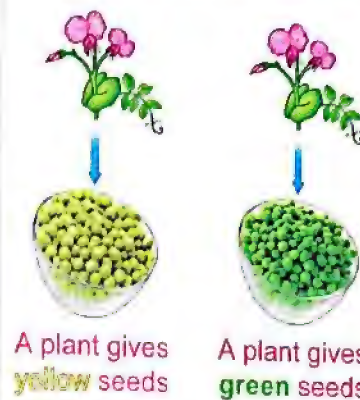
Mendel's experiments in heredity

FIRST Study the inheritance of any one pair of contrasting traits

- Mendel studied the inheritance of each pair of these contrasting traits separated by the following specific scientific steps.

Mendel's experiment to study the inheritance of the seed colour trait of pea plant.

Mendel chose a pea plant that produces **yellow** seeds and other pea plant that produces **green** seeds, then he made self-pollination for these plants for several generations **G.R.** To be sure of the purity of this trait.



A plant gives yellow seeds

A plant gives green seeds

Mendel observed that :

1 The plants that have **yellow** seeds produce plants with **yellow** seeds, a generation after generation, and also the plants that have **green** seeds produce plants with **green** seeds.

So, he concluded that :

The colour of the seed is pure in the plants that he had planted.

2 Mendel planted the seeds (pure **yellow** and pure **green**), and when they produce plants (parents) carrying flowers, he removed the stamens of some of these flowers before the anther becomes mature **G.R.** To insure that the plant doesn't self-pollinate.

Removing the stamens from the flowers of pea plant

✻ Mendel made cross-pollination as follows :

- By transferring the pollen grains from the anthers of plants' flowers that produce **green** seeds to the stigmas of plants' flowers which removed their stamens and produce **yellow** seeds.
- By transferring the pollen grains from the anthers of plants' flowers that produce **yellow** seeds to the stigmas of plants' flowers which removed their stamens and produce **green** seeds.

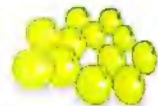
Cross-pollination in pea plant

✻ Then, he covered the stigmas of the pistils after pollination **G.R.** To prevent cross-pollination again.

3 ✻ Then, he planted the produced seeds.

✻ Mendel observed that :

All the produced plants which he named them the first generation have **yellow** seeds (at a percentage of 100%) and the **green** coloured seeds trait disappeared completely in the individuals of first generation.



First generation 100% yellow seeds

So, Mendel called :

- The **yellow** colour of seeds is a dominant trait **G.R.**
  Because it dominates over the **green** colour trait and appears in the first generation at a percentage of 100 %.
- The **green** colour of seeds is a recessive trait **G.R.**
  Because it disappears completely in the individuals of the first generation.

4 Mendel let the first generation plants do **self-pollination**, then he planted the resulting seeds.

✻ Mendel observed that :

- The produced plants which he named them the second generation :
  - Three quarters are of **yellow** seeds **(75 %)**.
  - Its quarter is of **green** seeds **(25 %)**.

  This means that the ratio of the plants of the second generation :

yellow seeds	:	**green** seeds
3	:	1

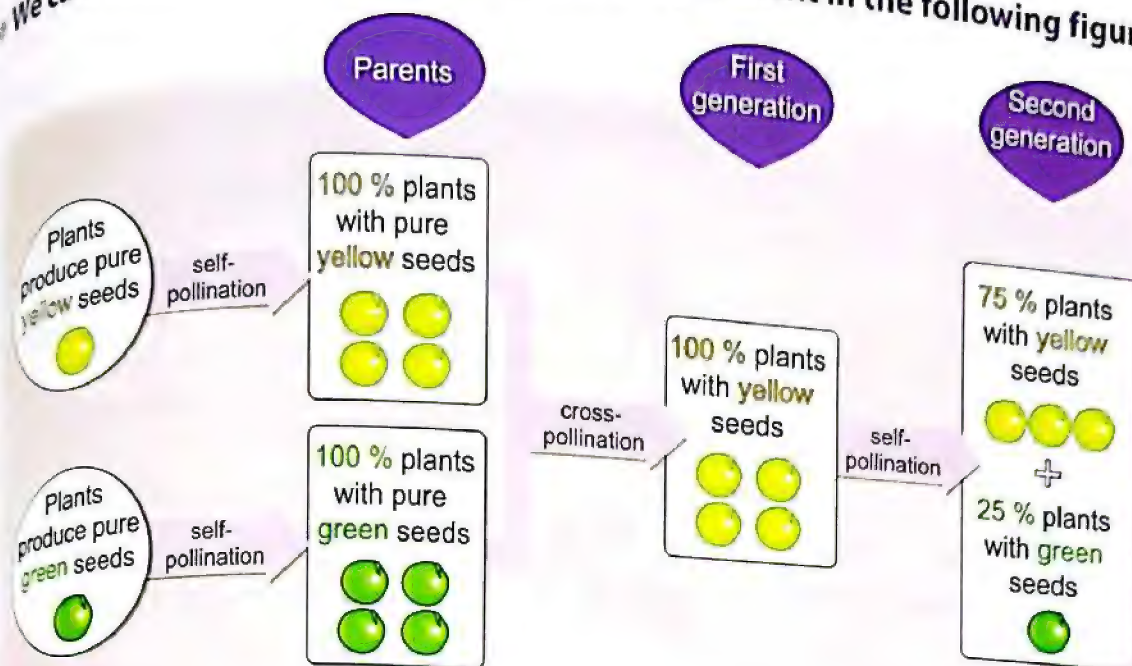
- The **green** colour trait of seeds which disappears in the first generation, it appears in the second generation.

Self-pollination in pea plant

Plants of second generation

75 %		25 %
Yellow seeds	:	Green seeds
3	:	1

- We can summarize the previous Mendel's experiment in the following figure :



The principle of complete dominance

- When Mendel repeated his previous experiment on the rest of other traits of the pea plant, the results were similar to those obtained from his experiment on the seeds colour trait.
- He named the dominance of the dominant trait on the recessive trait in the first generation the term of "**The principle of complete dominance**".

The principle of complete dominance

It is the appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed, one of them carries a pure trait contrasting the trait carried by the other individual.

G.R. ***On mating a pea plant of yellow seeds with a pea plant of green seeds, all the produced plants are of yellow seeds.***

Because the yellow colour trait of seeds dominates over the green colour trait of seeds according to the principle of complete dominance.

* The following table shows the dominant traits and recessive traits of pea plant which Mendel studied.

Trait	Dominant trait	Recessive trait
Flower colour :	Red	White
Flower position :	Side	End
Seed colour :	Yellow	Green
Seed shape :	Smooth	Wrinkled
Stem height :	Tall	Short
Pod (fruit) colour :	Green	Yellow
Pod (fruit) shape :	Swollen	Sinuous

Mendel's assumptions to explain the results of his experiments

* Mendel put several assumptions to explain the results he obtained through the experiments of the pea plant, as follows :

Assumptions	Application on the seeds colour trait of peas
1 The hereditary traits are transmitted from the parents to the offspring by means of hereditary factors carried by **Gametes**.	The trait colour of seeds of pea plant transmitted from one generation to another by means of hereditary factors carried by **Gametes [pollen grains & ovules]**.
2 Each hereditary trait is controlled by two hereditary factors, one from the father and the other from the mother.	The colour of the seeds is controlled by two hereditary factors, one determines the yellow colour and the other determines the green colour.
3 The two hereditary factors of each trait **separate** when the **gametes** are formed, where each gamete carries only one factor from these two factors.	The two factors of the colour of the seeds are separated when formation of gametes, where each gamete **(pollen grain or ovum)** carries only one factor from these two factors.
4 During **fertilization process**, the two hereditary factors **aggregate** again. If the two factors are : • **Similar (or homozygous)**, so the produced trait (**Dominant** or **Recessive**) is **pure** and the individual that carries this trait is called **pure individual**. Dominant factor + Dominant factor ⇨ Pure dominant trait Recessive factor + Recessive factor ⇨ Pure recessive trait	* **When aggregation :** • The yellow colour factor of seeds (dominant) with the yellow colour factor of seeds (dominant), the result are plants with pure yellow seeds. • The green colour factor of seeds (recessive) with the green colour factor of seeds (recessive), the result is plants with pure green seeds.
• **Different (or heterozygous)**, so the produced trait (**Dominant**) is **impure** and the individual that carries this trait is called **Hybrid individual**. Dominant factor + Recessive factor ⇨ Impure dominant trait	* **When aggregation :** • The yellow colour factor of seeds (dominant) with the green colour factor of seeds (recessive), the result is plants with impure yellow seeds, as a result of the yellow colour factor of seeds dominates over the green colour factor of seeds.

Gametes

The cells by which the hereditary traits are transmitted from parents to offspring.

* Mendel summarized the previous assumptions in his first law, which is known as the law of segregation of factors **G.R.**

To segregate (separate) the two factors of the trait from each other during the formation of gametes.

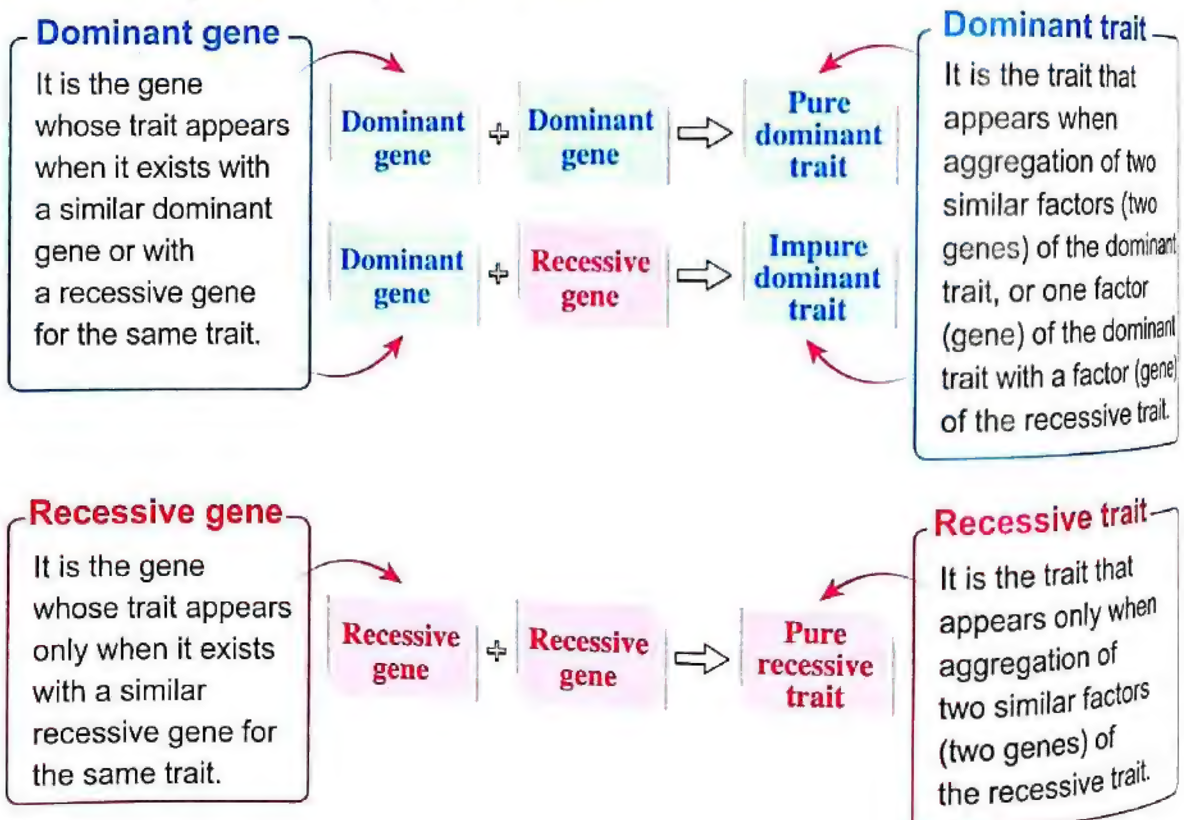
Law of segregation of factors (Mendel's first law)

When two pure individuals of any one pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

NB Segregation (separation) of factors occurs during the formation of gametes in meiosis.

* The Danish scientist Johansen used the term **gene** instead of the hereditary factor and also he introduced :
  - The term "genotype" for the gene structure in the living organism.
  - The term "phenotype" for the hereditary trait that appears on the living organism.

* **From the previous explanation, we conclude that :**



What happens when ...?

- The presence of a dominant gene for one of the traits with a recessive gene for the same trait.
- The dominant gene dominates over the recessive gene, so the dominant trait appears.

Comparison between the dominant trait and the recessive trait :

Points of comparison	Dominant trait	Recessive trait
Definition :	It is the trait that appears when aggregation of two similar factors (two genes) of the dominant trait, or one factor (gene) of the dominant trait with a factor (gene) of the recessive trait.	It is the trait that appears only when aggregation of two similar factors (two genes) of the recessive trait.
Example :	The trait of yellow colour seeds of peas.	The trait of green colour seeds of peas.
The ratio of its appearance on mating an individual carries a pure dominant trait with another carries a recessive trait :	It appears at a percentage of 100% in the first generation and at a ratio of 75% in the second generation.	It disappears in the first generation and appears at a percentage of 25% in the second generation.
Purity of the trait :	It is pure or hybrid.	It is always pure.

- **Accordingly, the pure individual and the hybrid individual can be defined as follows :**

Pure individual

It is the individual that carries a similar pair of genes (factors) either dominant trait or recessive trait, so the dominant trait (pure) or the recessive trait appears on the individual.

Hybrid individual

It is the individual that carries a different pair of genes (factors), one is dominant and the other is recessive, so the dominant trait (impure) appears on the individual.

Using symbols to represent the experiments of heredity

- **To facilitate the process of studying the transmission of hereditary (genetic) traits from one generation to another, the following symbols and terms are used :**

Term	Male individual	Mating	Female individual	Parents	Gametes	First generation	Second generation
Symbol	♂	×	♀	P	G	F_1	F_2

✲ **The two factors of pure hereditary trait** are symbolized by two similar letters, often representing the first letter of the name of **dominant trait** in English language, where :

- The dominant trait is represented by a capital letter.
- The recessive trait is represented by a small letter.

So,

- The genetic structure of pure dominant individual is symbolized by two capital letters.
- The genetic structure of recessive individual is symolized by two small letters.
- The genetic structure of hybrid dominant individual is symbolized by two letters one is capital and the other is small.

(Taking into consideration, the symbol of the dominant gene is always written on the left)

Application **To express the symbols about the stem height (Tall) in pea plant,**

- The gene of tall stem trait is represented by T
- The gene of short stem trait is represented by t

So,

- The genetic structure of a pure tall stem plant is symbolized by TT
- The genetic structure of a short stem plant is symbolized by tt
- The genetic structure of a hybrid tall stem plant is symbolized by Tt

Question 1

- *If you know that the genetic symbol of :*

- Tall stem T
- White flowers r
- Yellow pods g
- Smooth seeds S

Complete the following table :

Plant :	Yellow pod	Pure red flowers	Hybrid smooth seeds	White flowers	......	......	Hybrid tall stem	Wrinkled seeds
Genetic structure :	......	......	......	......	tt	GG	......	......

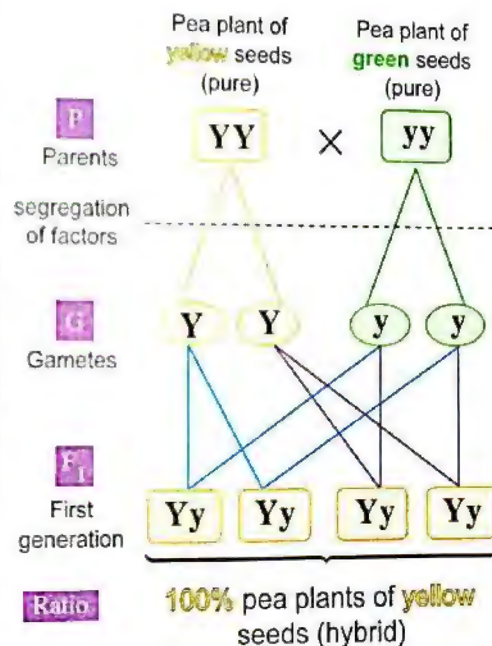
Exercise 1

Explain on the basis of genetic principles, the result of mating between two pea plants, one of them has pure yellow seeds and the other of pure green seeds.

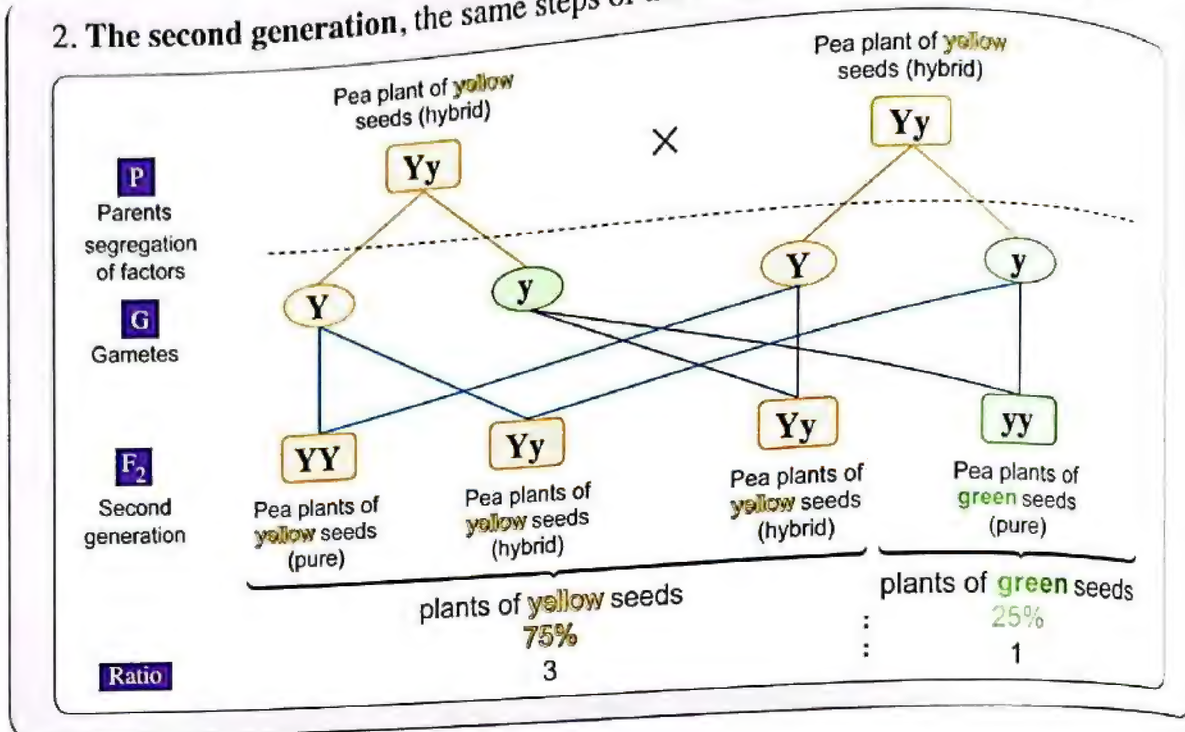
Mention the ratio between the individuals until the second generation.

Answer

1. **The first generation**, the following steps are followed :

Steps of answer		Answer
1 Parents (P) :	* **The genetic structure for the two parents is determined :** ∵ The two parents are pure and the gene of yellow colour of seeds dominates over the gene of green colour of seeds. ∴ The plant of pure yellow seeds is symbolized by (YY) and the plant of pure green seeds is symbolized by (yy). * **Put between the genetic structure of the two parents the mating sign (×).**	
2 Gametes (G) :	The two factors of each trait segregate during the formation of gametes.	
3 First generation (F_1) :	The two factors of each trait aggregate again on occurrence of fertilization process to form the individuals of the first generation.	
4 The ratio between the produced individuals :	The ratio between the produced individuals is determined, where each individual represents 25% from the generation.	

2. **The second generation**, the same steps of the first generation are followed :



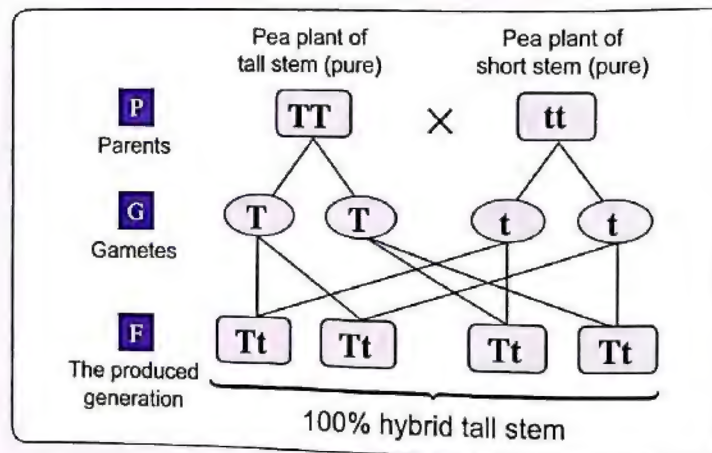
Guideline to solve problems :

If mating takes place between two individuals, and this mating produces 100% hybrid dominant trait, this means that one of parents carries the pure dominant trait and the other carries the contrasting recessive trait.

Exercise 2

On pollinating two pea plants with each other, all the produced plants are hybrid tall stem. Explain on the bases of genetic principles, the genetic structure of the two parents.

Answer



Guideline to solve problems :

If mating takes place between two individuals, and this mating produces 50 % hybrid dominant trait : 50 % recessive trait, this means that one of parents is hybrid dominant trait and the other carries the contrasting recessive trait.

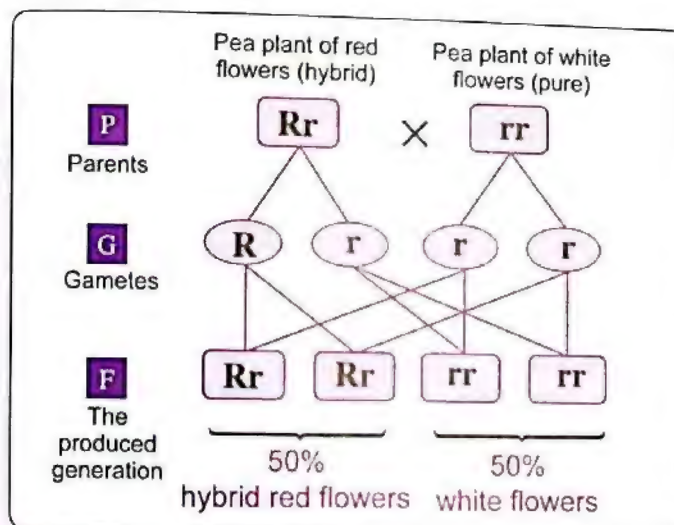
Exercise 3

If crossing takes place between two pea plants, one of them with red flowers and the other with white flowers, this crossing produces individuals with a percentage of 50 % hybrid red flowers : 50 % white flowers.

Explain on the bases of genetic principles :

The genetic structure of the parents and the produced individuals. Knowing that the symbol of the dominant gene is (R) and that of the recessive gene is (r).

Answer



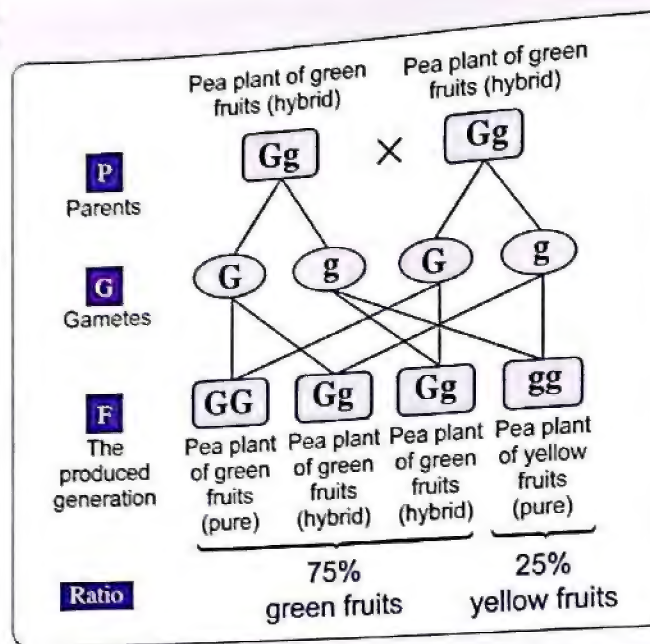
Guideline to solve problems :

If mating takes place between two individuals, and this mating produces 75% dominant trait : 25% recessive trait, this means that both parents are hybrid dominant trait.

Exercise 4

If a self-pollination takes place for pea plant of green fruits, this pollination produces individuals with a percentage of 75% green fruits : 25% yellow fruits. Using symbols to express this mating.

Answer



TRY to answer worksheet 10 in the Notebook

SECOND Study the inheritance of two pairs or more of contrasting traits

By another series of experiments, Mendel explained how two pairs of contrasting traits (as the red flower and tall stem) are inherited as follows :

1

He conducted a mixed pollination between two pea plants :

- One of pure tall stem and red flowers (the two traits are pure dominant).
- The second with pure short stem and white flowers (the two traits are recessive).

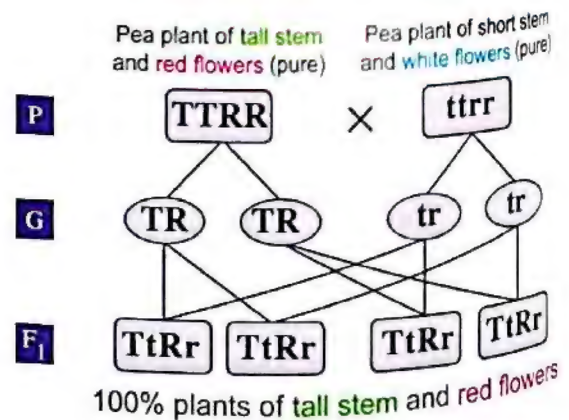
Then he planted the produced seeds.

Mendel observed that :

All the first generation plants had tall stem and red flowers (carry the dominant trait at a ratio of 100 %).

plant of tall stem and red flowers

plant of short stem and white flowers



100% plants of tall stem and red flowers

Mendel left the first generation plants to self-pollinate, then he planted the produced seeds.

* **Mendel observed that :**

The second generation plants have different traits as shown in the following table :

P Pea plant of tall stem and red flowers (hybrid) **TtRr** × **TtRr** Pea plant of tall stem and red flowers (hybrid)

G

F_2

♀ \ ♂	TR	Tr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

2 * When classification the traits of the produced individuals :

- According to the two pairs of contrasting traits, the results as follows :

The traits of individuals of second generation :	Pea plants			
	Tall stem & red flowers	Tall stem & white flowers	Short stem and red flowers	Short stem and white flowers
Ratio :	9 :	3 :	3 :	1

- According to each pair of contrasting traits, the results as follows :

Tall stem trait	plants of tall stem		plants of short stem
Ratio	12	:	4
(i.e.)	3	:	1

Flowers colour trait	plants of red flowers		plants of white flowers
Ratio	12	:	4
(i.e.)	3	:	1

* **From the previous results and others,** Mendel deduced that the inheritance of one trait has no effect on the inheritance of another trait, so he puts his second law (The law of independent assortment of hereditary factors) that states that :

Law of independent assortment of hereditary factors (Mendel's second law)

When two pure different individuals bearing two pairs or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

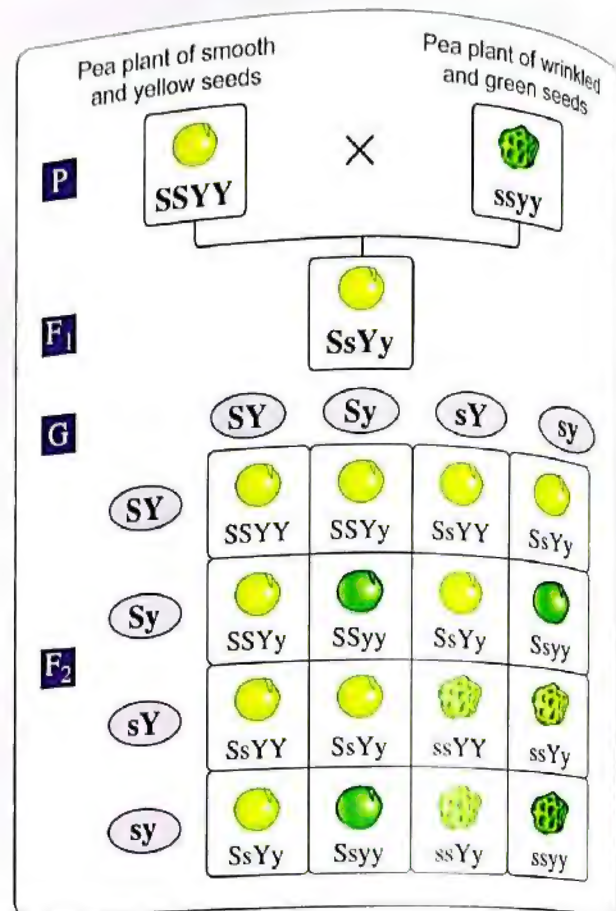
Exercise 5

The opposite figure shows the inheritance of two traits, the shape and the colour of seeds in pea plant.

(1) Which of these traits is dominant and which one is recessive ?

(2) Explain the genetic structure of gametes of individuals of first generation.

(3) Explain the traits of individuals of first and second generations and the ratio of each of them.



Answer

(1) * Dominant traits :

- Shape of smooth seeds.
- Colour of yellow seeds.

* Recessive traits :

- Shape of wrinkled seeds.
- Colour of green seeds.

(2) Genetic structure of gametes of individuals of first generation : SY , Sy , sY , sy

(3) Traits of individuals of first generation :

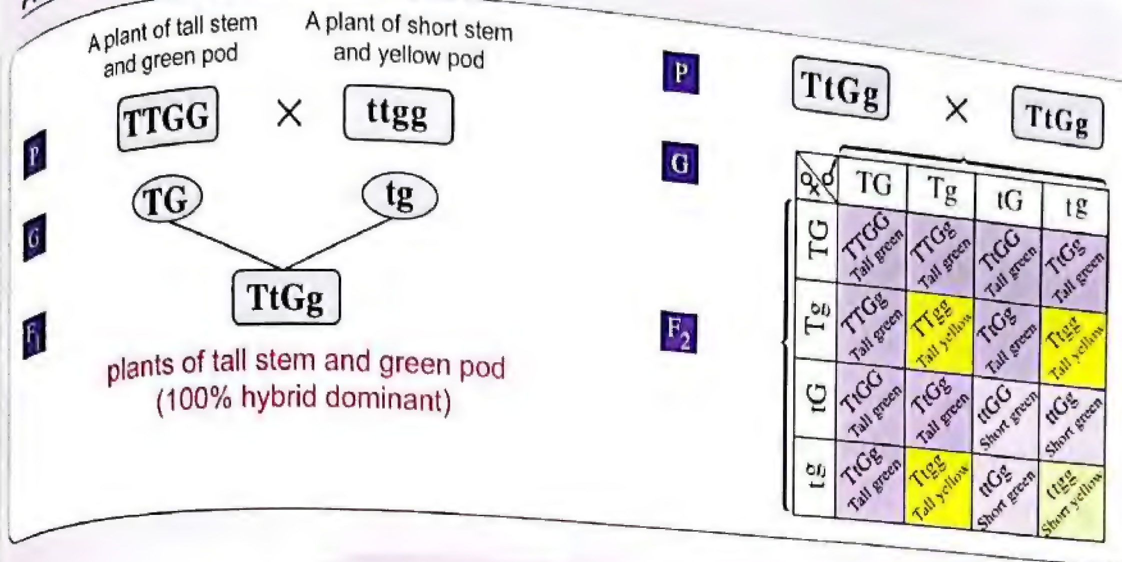
Pea plants of smooth and yellow seeds at a ratio of 100 %

Traits of individuals of second generation	Pea plants: Smooth & yellow seeds	Wrinkled & yellow seeds	Smooth & green seeds	Wrinkled & green seeds
Ratio	9 :	3 :	3 :	1

Exercise 6

A pea plant with tall stem and green pod (TTGG) pollinates another one with short stem and yellow pod (ttgg). Explain on the bases of genetic principles, the genetic structure for the first and second generations.

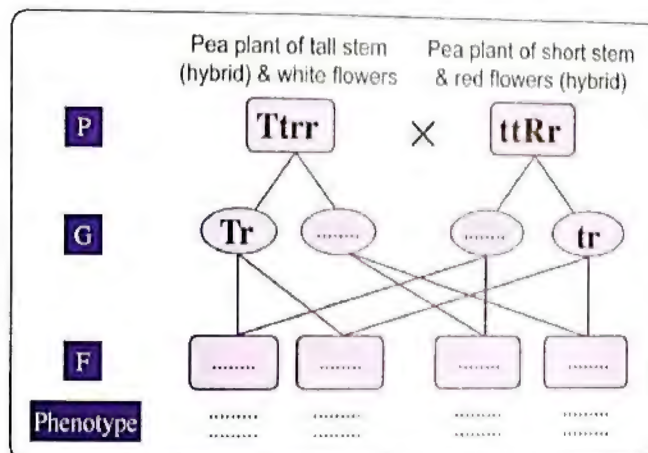
Answer



Traits of individuals of second generation	Tall stem and green pods	Tall stem and yellow pods	Short stem and green pods	Short stem and yellow pods
	Pea plants			
Ratio	9 :	3 :	3 :	1

Question 2

Complete the following diagram, then conclude the phenotype of the produced individuals :



Enriching information

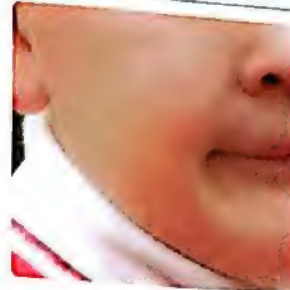
The results showed that inheriting some traits followed Mendel's laws, but there were cases that did not completely follow Mendel's laws, and it was agreed to name them the ***non-Mendelian heredity.***

The dominant and recessive traits in the human being

- Scientists found that many human hereditary traits follow the Mendelian heredity, where the trait is controlled by one pair of genes.
  1. The individuals that inherit at least one dominant gene from one of their parents, will have the dominant trait.
  2. Those who receive a recessive gene from both parents, will have the recessive trait.

❋ The following table shows some of the human traits that follow the principle of complete dominance :

Trait	Dominant	Recessive
1 Tongue :	The ability to roll the tongue	The inability to roll the tongue
2 Ear lobe :	Free ear lobe	Attached ear lobe
3 Nature of hair :	Curly hair	(Straight) Smooth hair
4 Colour of hair :	Black hair	Light colour hair

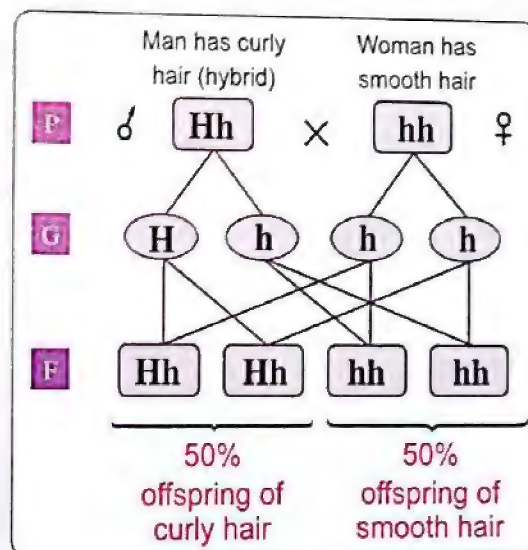
5 Size of eyes :	Wide eyes	Narrow eyes
6 Colour of eyes :	Brown eyes	Coloured eyes (Blue, green, grey)
7 Check dimples :	Dimples	 No dimples
8 Facial freckles :	No freckles	Freckles

Exercise 7

Explain on genetic bases, the traits of the offspring resulted from the crossing between a man who has curly hair (Hh) and a woman who has smooth hair showing the genetic structure.

Answer

The smooth hair is a recessive trait, so the genetic structure of the woman is (hh).



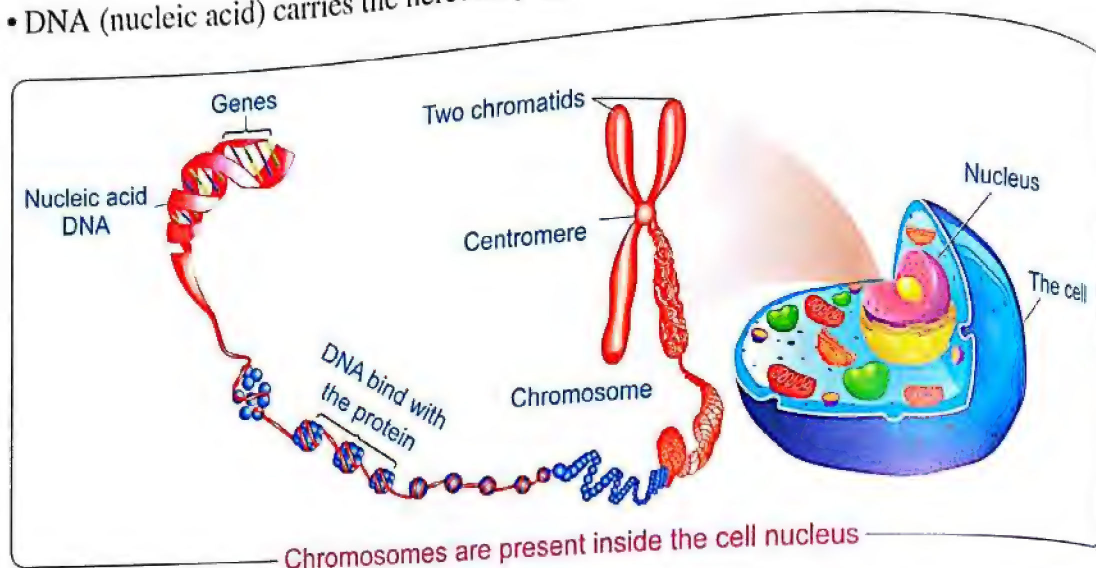
G.R. ***The ability of rolling the tongue is from the dominant traits in the human being.***

Because the gene of the ability to roll the tongue dominates over the gene of the non-ability to roll the tongue if they are both present in an individual.

The chemical structure of nucleic acid (DNA)

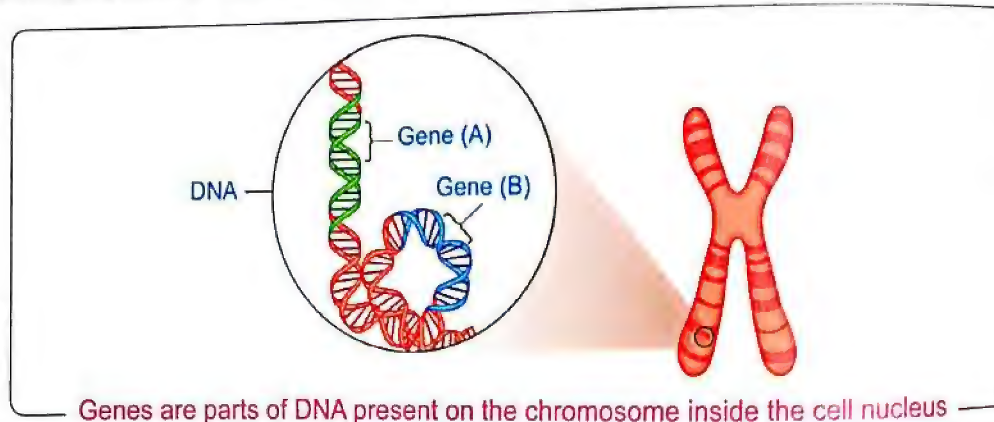
❋ You have known from the first term that :

- The cell nucleus contains chromosomes.
- The chromosome chemically consists of a nucleic acid (DNA) combined with protein.
- DNA (nucleic acid) carries the hereditary (genetic) traits of the living organism.



Chromosomes are present inside the cell nucleus

❋ Scientists have found that the nucleic acid (DNA) consists of small parts called **"Genes"**.



Genes are parts of DNA present on the chromosome inside the cell nucleus

Genes

They are parts of DNA present on the chromosomes and they are responsible for appearing the individual's hereditary traits.

NB Genes consist of smaller structural units called nucleotides.

* We can summarize the previous explanation in the following diagram :

Nucleic acid DNA consists of small parts called **Genes** Each of them consist of structural units called **Nucleotides**

Model of Watson and Crick for composition of DNA molecule

- The scientists Watson and Crick were able to make a model of the DNA molecule.
- DNA molecule is composed of two strands coiled around each other forming a double helix shape.

Watson

Crick

How do the genes perform their functions ?

- The scientists Badel and Tatum discovered the means of how the genes control the appearance of genetic traits.
- The two scientists received for that a Nobel Prize in the year 1958.

Badel

Tatum

Explain ...?

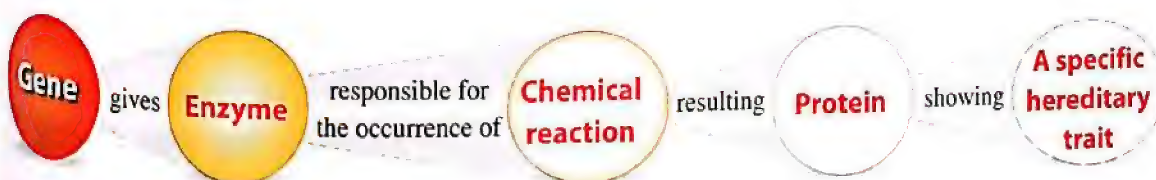
- **Mechanism of action of the gene.**
- **How do the genes control the appearance of genetic (hereditary) traits?**

➲ Every gene gives a special enzyme.

➲ This enzyme is responsible for the occurrence of a chemical reaction.

➲ Each chemical reaction resulting a protein showing a specific hereditary trait.

- **The following diagram shows the mechanism of action of the gene :**



Applications

1. Inheritance of the trait of brown eyes colour "Dominant trait"

2. Inheritance of the trait of black hair colour "Dominant trait"

When a person inherits from one of his parents, the gene responsible for appearance of

1	2
The trait of brown eyes colour	The trait of black hair colour

So, this gene gives an enzyme which is responsible for occurrence of a chemical reaction resulting

1	2
a protein works on the appearance of the trait of brown eyes colour.	a protein works on the appearance of the trait of black hair colour.

Science, Technology and Society

Genetic engineering (Bio-technology)

- Genetic engineering is one of the branches of modern genetics and one of its most important applications in the field of medical agriculture is the production of genetically modified rice to combact diseases caused by malnutrition.

Genetically modified rice

- Around 500.000 people every year are affected by losing their sight in developing countries (Southeast Asian countries) **G.R.**

  Due to malnutrition caused by the deficiency in vitamin (A). It is one of the important elements of nutrition, whose deficiency leads to malnutrition.

- Deficiency in vitamin (A) is widespread in those who depend on eating rice **G.R.**

  Because rice does not contain pro-vitamin (A) which is known as carotene, which is converted into vitamin (A) inside the body.

Golden rice is genetically modified

- This health problem has been solved by production of genetically modified rice containing carotene.

What is the scientific basis for the production of rice containing carotene ...?

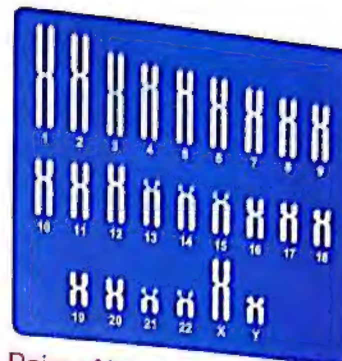
➲ Modifying the genetic composition of the rice crop by inserting the genes that result in the creation of the pro-vitamin (A) compound inside the tissue that store starch in the rice grains.

3 Life application

The human genome project :

The human genome

It is a genetic map that shows the complete set of genes that are present on the human chromosomes.


Pairs of human chromosomes

The aims of the project

This project started in October 1990 to obtain a detailed very precise map for the sequence of the nitrogenous bases to be able to :

1. Determination all the human inheriting factors (genes) and identification the various hereditary functions to the human.
2. Identification the genes responsible for the various diseases like cancer, diabetes, vascular diseases, mental diseases.
3. Determination the various mutations on the function of the genes.
4. Understanding the human biology and identifying the single differences in the genome between one person and another.

The resultants of the project

This project showed the similarity of humans in more than 99 % from the sequence of nucleotides of DNA, therefore the single differences in humans **such as :** the colour of eyes, colour of skin, height and other traits form a very small percentage of this sequence.

Despite the small percentage of these differences, they affect to a great extent the acceptance of the individual to :

- The harmful environmental effects like bacteria, viruses, poisons, chemicals.
- Medicines and various treatments.

TRY To answer worksheet 11

- General Exercise of the School Book on Unit 3
- Model Exams on Unit 3

in the Notebook

Remember

The Lesson

- **There are two types of traits :**
  1. **Hereditary traits :**
     They are the traits that are transmitted from one generation to another.
     Ex. Hair colour, skin colour, ...
  2. **Acquired traits :**
     They are the traits that aren't transmitted from one generation to another.
     Ex. The skill of playing football, speaking in many languages, ...
- The scientist **Gregor Mendel** was the first founder of **heredity**.
- **Genetics :**
  It is the science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring.
- **Gametes :**
  The cells by which the hereditary traits are transmitted from parents to offspring.
- **The principle of complete dominance :**
  It is the appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed, one of them carries a pure trait contrasting the trait carried by the other individual.
- If the factors are similar or homozygous, the trait is pure and if they are different or heterozygous, the trait is impure (hybrid).
- **Mendel's first law (law of segregation of factors), it states that :**
  When two pure individuals of any one pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).
- **Dominant trait :**
  It is the trait that appears when aggregation of two similar factors (two genes) of the dominant trait or one factor of the dominant trait with a factor of the recessive trait.
- **Recessive trait :**
  It is the trait that appears only when aggregation of two similar factors (two genes) of the recessive trait.
- **Hybrid individual :**
  It is the individual that carries a different pair of genes, one is dominant and the other is recessive, so the dominant trait (impure) appears on the individual.

Pure individual :

It is the individual that carries a similar pair of genes either dominant or recessive, so the dominant trait (pure) or the recessive trait appears on the individual.

Mendel's second law (law of independent assortment of factors), it states that :

When two pure different individuals bearing two pairs or more of alternative traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

From dominant traits in human being are :

Curly hair, black hair, wide eyes, brown eyes, presence of dimples, absence of freckles, ability to roll the tongue and free ear lobe.

From recessive traits in human being are :

Smooth hair, light colour hair, narrow eyes, coloured eyes, absence of dimples, presence of freckles, the inability to roll the tongue and attached ear lobe.

Genes :

They are parts of DNA present on the chromosomes and they are responsible for appearing the individual's hereditary traits.

- DNA molecule consists of genes which consist of more smaller structural units called nucleotides.
- Scientists **Watson** and **Crick** were able to make a model of DNA molecule.
- DNA molecule is composed of two strands coiled around each other forming a double helix shape.
- Scientists **Badel** and **Tatum** discovered the means of how the gene controls the appearance of a trait.
- Every gene gives a special enzyme which is responsible for the occurrence of chemical reaction resulting a protein showing a specific hereditary trait.

Questions on the lesson

● Remember ● Understand ● Apply ● Higher skills ▢ School book questions.

Interactive Exercises

1. Choose the correct answer :

1. .... is from the hereditary traits.
   a. Speaking in many languages
   b. Playing football
   c. Blood group
   d. Learning of swimming

2. .... is considered as the founder of heredity. (Suez 2...)
   a. Ohm
   b. Mendel
   c. Becquerel
   d. Watson

3. Mendel conducted his experiments on pea plant by using .... pairs of traits.
   a. 5
   b. 7
   c. 9
   d. 11

4. The flowers of pea plant are .... (Behira 20..)
   a. self-pollinated only.
   b. cross-pollinated only.
   c. artificially pollinated only.
   d. all the previous answers.

5. By crossing a pea plant with green seeds with another with pure yellow seeds, so the ratio of plants with yellow seeds to that with green seeds in the second generation is .... respectively.
   a. 3 : 1
   b. 1 : 1
   c. 2 : 1
   d. 1 : 3

6. Mendel has covered .... of the pistils in order not to cross-pollinate from other flowers. (Fayoum , Menia 2...)
   a. stamens
   b. stigmas
   c. sepals
   d. petals

7. Mendel removed the stamens of plant flowers before the anther becomes mature to prevent ....
   a. self-pollination.
   b. cross-pollination.
   c. artificially pollination.
   d. cross and artificial pollination together.

8. Mendel leaves pea plants to .... several times to ensure the purity of the trait.
   a. self-pollinated
   b. cross-pollinated
   c. artificially pollinated
   d. all the previous answers

9. Mendel observed from his experiments on pea plant that the .... trait appears in the second generation at a ratio of 25% on studying each trait separately.
   a. tall stem
   b. red flowers
   c. sinuous pods
   d. side flowers

10. Mendel chose the garden pea plant to conduct his research for these reasons except .... (Dakahlia 2018)
    a. it is easy to plant the pea plant.
    b. it can self-pollinate.
    c. it can easily be artificially pollinated.
    d. its life cycle is long.

11. All of the following are dominant hereditary traits in pea plant except ....
a. smooth seeds. b. green seeds. c. red flowers. d. swollen fruits.

12. The trait that disappears in the first generation and reappears in the second generation is called the .... trait. *(Giza 2015)*
a. dominant b. hereditary c. recessive d. acquired

13. Hereditary factors are transmitted from parents to offspring by ....
a. somatic cells. b. gametes. c. traits. d. pollination.

14. According to Mendel's first law, the hereditary factors .... when gametes are formed.
a. combine b. fuse c. segregate d. disappear
(Giza 2021 / Fayoum 2018)

15. From the recessive traits which Mendel studied ....
a. tall stem. b. short stem. c. red flower colour. d. smooth seed.

16. On pollination pea plant produces yellow seeds for several generations with a plant produces green seeds for several generations, it produces .... *(Beni Suef 2016)*
a. plants produce green seeds. b. plants produce yellow seeds.
c. 50 % plants produce green seeds : 50 % plants produce yellow seeds.
d. 75 % plants produce yellow seeds : 25 % plants produce green seeds.

17. The recessive trait appears on one of the sons, if he inherited .... from their parents.
a. two dominant genes b. only one dominant gene
c. two recessive genes d. a recessive gene and a dominant gene
(Damietta , Ismailia 2019)

18. The gene which prevents the appearance of the effect of the other gene is known as ....
a. homozygous. b. heterozygous. c. dominant. d. recessive.

19. The .... trait is pure always. *(Ismailia 2015 / Red Sea 2019)*
a. acquired b. hereditary c. dominant d. recessive

20. The two factors of a hereditary trait are similar in the .... individual.
a. pure b. hybrid c. recessive d. (a) and (c)
(Sharkia 2021 / Matrouh 2019)

21. The percentage of appearance of the dominant trait through the individuals of the first generation is .... according to Mendel's first law.
a. 25% b. 30% c. 100% d. 75%

22. The result of pollination between two pea plants, one with hybrid yellow seeds and the other with pure green seeds is .... *(North Sinai 2011)*
a. 100% green seeds. b. 100% yellow seeds.
c. 50 % green seeds and 50% yellow seeds. d. 75% yellow seeds and 25% green seeds.

23. On mating two hybrid parents, the percentage of recessive traits in offspring is .... %.
a. 75 b. 50 c. 25 d. zero

24. If two hybrid individuals crossing with each other, 300 individuals produced due to this crossing, so the number of the hybrid individuals among offspring may be .... individual.
a. 50 b. 100 c. 150 d. 200
(Menofia 2017 , 2018 / Sharkia 2019)

25. On crossing male and female, their genotype (Bb), so the genotype (BB) is produced in their offspring at a percentage of .... *(Giza 2021 / Luxor 2019)*
a. 25% b. 50% c. 75% d. 100%

26. If the genetic structure of one of the producing individuals (aa), the genetic structure of the parents may be .... *(Menia 2016)*
a. Aa × AA b. AA × AA c. aa × Aa d. aa × AA

27. According to Mendel's second law, the dominant trait appears in the second generation at a percentage of .... *(Beni Suef 2018)*
a. 25 % b. 50 % c. 75 % d. 100 %

28. Mendel's second law is known as the law of .... of factors. *(Giza 2018 / Qalyoubia 2019)*
a. independent assortment b. segregation
c. merging d. disappearance

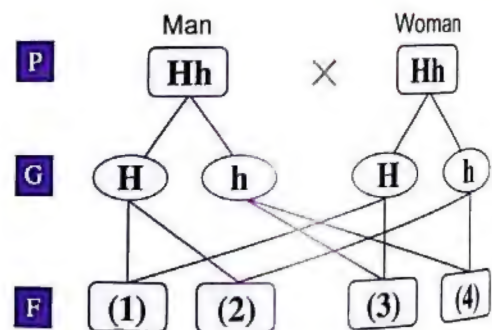
29. According to Mendel's second law, the recessive trait appears in the second generation at a percentage of .... *(Luxor 2017)*
a. 50% b. 100% c. 75% d. 25%

30. The genetic structure of a dwarf stem pea plant and its flowers are white is ....
a. ttRR b. TTrr c. ttrr d. TTRR
(Gharbia 2016 / Damietta 2017)

31. The genetic structure of wrinkled yellow coloured seeds of a pea plant is ....
a. YYSS b. yyss c. YYss d. yySS
(Damietta 2021 / Menofia 2019)

32. According to Mendel's second law, each pair of the alternative traits is inherited independently of the others and appears in the second generation at a ratio of ....
a. 1 : 1 b. 2 : 1 c. 3 : 1 d. 4 : 1
(Sharkia 2021 / Cairo 2018)

33. The opposite figure represents the inheritance of one of humans traits. What is the number of the child that carries the recessive trait ? ....
a. (1) b. (2)
c. (3) d. (4)



34. From the dominant trait in the human being is the .... trait. *(Cairo, Sharkia 2018)*
a. straight hair b. wide eyes
c. no dimples in the face d. presence of freckles in the face

35. In Mendel's second law, the alternative traits are inherited ....

a. independently. b. dependently. c. separately. d. collectively.

36. When a short stemmed, white flowered pea plant is cross pollinated with a long stemmed, red flowered pea plant, all plants of 1st generation are .... *(Port Said 2013 / Matrouh 2018)*

a. long stemmed & white flowered. b. long stemmed & red flowered.
c. short stemmed & white flowered. d. short stemmed & red flowered.

37. The ability to roll the tongue is one of the .... traits in the human being. *(Sohag 2018)*

a. dominant b. recessive c. hybrid d. hermaphrodite

38. Which of the following traits is dominant in human being ? ....

a. Smooth hair. b. Narrow eyes.
c. Attached ear lobe. d. Absence of freckles.

(Qalyoubia , North Sinai 2019)

39. Which one of these traits is recessive in humans ? .... *(Sohag 2019)*

a. Curly hair. b. Wide eyes. c. Free ear lobe. d. Straight hair.

40. Which of the following traits is recessive in humun body ? ....

a. Wide eyes. b. Black hair.
c. Presence of dimples. d. Presence of freckles. *(Qena 2018)*

41. When mating a white male from Guinea pigs with a black female of the same species, the resulting generation was all white colour. What is the colour trait of the male parental individual ? ....

a. Pure recessive. b. Hybrid dominant. c. Pure dominant. d. Hybrid recessive.

42. When mating a short male wing of Drosophila insect with a long female wing, all the first generation are of long wings. If a male and a female from this generation mate, the predicted percentage for appearance of long wings insects in the second generation is ....

a. 25 % b. 50 % c. 75 % d. 100 %

43. In the opposite figure, if you know that the symbol of the gene of green colour pods in pea plant is (G), the yellow colour is (g), the swollen shape is (I) and the sinuous shape is (i).

♀ \ ♂	GI	Gi	gI	gi
GI				(1)
Gi		(2)		
gI	(3)			
gi				(4)

(A) the pods of plant (3) are ....

a. green and swollen. b. yellow and swollen.
c. green and sinuous. d. yellow and sinuous.

(B) The genetic structure of plant (2) is ....

a. Ggli. b. GGii. c. GgII. d. ggii.

(C) The pods of plant (1) are similar to the pods of plant ....

a. (2) b. (3) c. (4) d. no correct answer.

44. .... put the model of DNA molecule. (Kafr El-Sheikh 2017)
a. Ohm b. Mendel c. Watson d. Johansen

45. .... is/are the part(s) of DNA present on the chromosomes and control the hereditary traits of the individuals. (Suez 2017, 2018)
a. Genes b. Gametes c. Cytoplasm d. Nucleus

46. .... is chemically composed of the nucleic acid DNA combined with protein.
a. Cytoplasm b. Chromosome c. Gene d. Nucleus
(Dakahlia, New Valley 2018)

47. DNA molecule consists of .... strands. (Sharkia 2017)
a. two b. three c. four d. five

48. The chromosome is chemically consisted of a nucleic acid called .... combined with protein. (Assiut 2018)
a. RNA b. DNA c. HCl d. Gene

49. The two scientists .... discovered the means of how the gene controls the appearance of hereditary traits. (Giza 2018 / Assiut 2019)
a. Badel and Tatum
b. Watson and Crick
c. Watson and Tatum
d. Crick and Badel

50. Genes control the organism's genetic characteristics by producing ....
a. hormones. b. enzymes. c. fats. d. vitamins.
(Dakahlia 2021 / Beni Suef 2019)

51. Pro-vitamin (A) is called .... substance.
a. carotene b. deoxyribose sugar c. nucleotide d. chromosome

52. The genetically modified rice contains .... (Behira 2016 / Damietta 2018)
a. vitamin A.
b. folic acid.
c. carotene substance.
d. melanin substance.

53. Malnutrition produced as a result of deficiency of vitamin (A) in the body may lead to ....
a. cancer disease. b. losing the sight. c. polio. d. deafness.

54. The DNA is similar in humans at a percentage of more than ....
a. 1 % b. 99 % c. 50 % d. 75 %

55. All of the following are aims of the human genome project except .... (Menofia 2017)
a. obtaining desirable traits.
b. understanding the human biology.
c. determination all of the human genes.
d. identifying the single differences between one person and another.

2. Correct the underlined words :

1. Some traits are not transmitted from one generation to another and they are called the genetic traits. (Cairo , Dakahlia 2019)
2. Mendeleev is considered as the founder of heredity. (Sharkia 2017 / Fayoum 2018)
3. Mendel chose the bean plant to conduct his research. (Sharkia 2017)

4. Mendel chose ten traits in pea plant to conduct his experiments. *(Beni Suef 2019)*
5. From the recessive traits in the pea plant is the swollen pod shape. *(Behira 2021 / Beni Suef 2019)*
6. Mendel removed the petals from flowers of pea plant to prevent the self-pollination. *(Assiut, Luxor 2019)*
7. Mendel's first law is called the law of independent assortment of hereditary factors. *(Damietta 2021 / Dakahlia 2019)*
8. Mendel's second law is called the law of segregation of factors. *(New Valley 2019)*
9. If the result of crossing between two individuals is 50% dominant and 50% recessive, this means that the trait of the parents are pure dominant. *(Ismailia 2011)*
10. The mixed pollination between pea plants with pure yellow seeds, and pea plants with pure green seeds produces pea plants with pure green seeds. *(Gharbia 2018)*
11. The scientist Mendel has found out that the hereditary traits are transmitted from the parents to the offspring by means of hereditary factors, it is now called the enzymes. *(Cairo 2010)*
12. The pure individual who carries a pair of genes, one of dominant character and another of recessive character. *(Luxor 2019)*
13. The two hereditary factors are similar in the hybrid individual. *(Beni Suef 2018)*
14. When two individuals differ in two pairs or more of alternative traits copulate, the trait of each pair is inherited independently and appears in the second generation at a ratio of 4 : 1 *(Dakahlia 2015)*
15. The ratio of gametes TR in a pea plant whose genetic structure is TtRr is 75% *(Matrouh 2017 / Sharkia 2018)*
16. From the dominant traits in the human being is the attached ear lobe. *(Assiut 2018)*
17. Every gene gives a special hormone responsible for the occurrence of a reaction resulting in a protein showing a hereditary trait. *(Suez 2018)*
18. Genes are DNA parts present in the cytoplasm of the cell. *(North Sinai , Port Said 2019)*
19. The two scientists Badel and Tatum made a model for DNA molecule. *(Matrouh 2017)*
20. The two scientists Watson and Crick discovered the means of how the gene controls the appearance of a hereditary trait. *(Beni Suef 2017)*

3. Put (✓) in front of the correct statements and correct the false ones :

1. 📖 The acquired traits are transmitted from one generation to another. ( ) *(Port Said , Aswan 2018)*
2. The skill of swimming is one of the acquired traits. ( )
3. The green flowers and the yellow flowers are contrasting traits in pea plant. ( )
4. The recessive trait is the trait that appears in all individuals of the first generation in Mendel's experiments. *(Assiut 2012)* ( )
5. Each trait is controlled by two pairs of hereditary factors. ( )

6. The two factors of each trait segregate during formation of gametes, then aggregate during the fertilization. ( )
7. 📖 When a pure short stem pea plant is pollinated with a hybrid long stem one, all the produced plants are short stem. ( )
8. In the first law of Mendel, the two contrasting traits appear in the second generation at a ratio of 2 : 1 *(Qena 2011)* ( )
9. According to Mendel's second law, the Mendel's ratio for each pair of inherited traits equals 1 : 1 *(South Sinai 2019)* ( )
10. On crossing a recessive individual and a pure dominant individual, all the produced individuals are hybrid. ( )
11. Dominant gene has the ability to show its effect whether it is found with similar gene or with recessive gene. ( )
12. The hybrid individual carries a gene for the dominant characterstic and another one for the recessive characteristic. *(Qalyoubia 2018)* ( )
13. The two hereditary factors are similar in the hybrid individual. *(Gharbia 2021)* ( )
14. When a pea plant with green fruits (Gg) crossed with another one with yellow fruits (gg), 50% of the produced fruits are green. ( )
15. Narrow eye is one of the dominant traits in the human being. ( )
16. Straight hair is one of the recessive traits in the human being. ( )
17. The ability to turn the tongue in a tube shape is a dominant trait in human. ( ) *(North Sinai 2013)*
18. The individual which inherits one gene only for the presence of freckles in the face will not have this character. *(Gharbia 2021 / Qalyoubia 2018)* ( )
19. 📖 The free ear lobe is a dominant trait. *(Qena 2019)* ( )
20. 📖 The presence of check dimples is a recessive trait. ( )
21. 📖 Genes are parts of DNA found in the cytoplasm of the cell. *(Alex. Matrouh 2018)* ( )
22. Identifying the various hereditary functions to the human being is one of the aims of the human genome project. ( )
23. The nucleus of each cell carry a complete group of hormones which are responsible for appearring the hereditary traits in living organisms. *(Cairo 2017)* ( )
24. Chromosomes is chemically consists of nucleic acid DNA binds with fat. *(Damietta 2017)* ( )

4. Write down the scientific term of each of the following statements :

1. • 📖 The traits (characters) that are ready to be transmitted from one generation to another. *(Red Sea 2016 / Matrouh 2018)*
   • The traits that are transferred from generation to another such as blood group. *(Alex. 2018)*
2. 📖 The traits that are not transmitted from one generation to another. *(Kafr El-Sheikh , Behira 2021)*

3. • The branch of science that aims to explain how different characteristics transfer through generations.

• The science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and their offspring. *(Assiut 2021 / Beni Suef 2019)*

4. The first person who started the scientific study of heredity through experiments. *(Kafr El-Sheikh 2013)*

5. The plant which Mendel used in his experiments. *(Fayoum 2021 / Menofia 2018)*

6. The appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed, one of them is carrying a pure hereditary trait contrasting the trait carried by the other individual. *(Qena 2018 / Aswan 2019)*

7. • Special structure through which the hereditary traits are transmitted from parents to the offspring. *(Dakahlia , Matrouh 2019)*

• The cells that transmit the hereditary traits from parents to the offspring. *(Menofia 2019)*

8. When two pure individuals of any one pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait). *(Assiut 2013)*

9. The trait that appears in all individuals of the first generation in Mendel's experiments. *(Cairo , Damietta 2021)*

10. The trait that disappears completely in the individuals of the first generation.

11. The individual that carries a similar pair of genes (hereditary factors) either dominant or recessive. *(Ismailia 2018 / Fayoum 2019)*

12. The individual that carries a contrasting pair of genes, one is dominant and the other is recessive. *(Menofia 2021 / Sohag 2019)*

13. The gene whose effect disappears when it exists with another gene.

14. When two pure different individuals bearing two pairs or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait) *(Giza 2015/ Assiut 2018)*

15. • Parts of DNA that are present on the chromosomes and carry (or control) the hereditary traits of the individual. *(Damietta, Menofia 2021)*

• They consist of smaller structural units called nucleotides. *(Sharkia 2016)*

16. • It is chemically consists of a nucleic acid called DNA combined with protein. *(Cairo , Sharkia 2021)*

• It is found in the cell nucleus and carried the genetic material, and chemically consisted of a nucleic acid called DNA binds with the protein. *(Fayoum 2018)*

17. A model for DNA molecule which is composed of two strands coiled around each other forming a double helix shape. *(Giza 2016)*

18. The substance formed by the gene and it is responsible for the occurrence of chemical reaction. (Luxor 2019) (Kafr El-Sheikh 2019)
19. The scientists who made a model for the DNA molecule.
20. The vitamin whose deficiency causes the loss of sight. (Damietta 2016)
21. • A detailed map includes all the human chromosomes. (Behira 2021)
 • The genetic map of genes that are present in human chromosomes.
22. The substance which is converted into vitamin (A) in the body.

5. Complete the following statements :

1. The science that researches the transmission of hereditary traits from one generation to another is .... (Beni Suef 2019)
2. There are two kinds of traits which are .... traits and .... traits.
3. .... traits are transmitted from one generation to another. (Dakhlia 2017 / Sohag 2019)
4. .... traits are not transmitted from one generation to another. (Menofia 2021 / Sohag 2019)
5. The skill of swimming is an example of .... traits, while the blood group is an example of .... traits. (Damietta, New Valley 2018)
6. The scientist .... is the founder of heredity, he used the seeds of .... plant, because its flowers are .... and thus it can self-pollinate. (New Valley 2017)
7. Despite the numerous different (contrasting) traits of pea plant, Mendel chose .... main traits to conduct his experiments. (Menofia 2015)
8. Pea plant can be easily .... and its life cycle is .... (Fayoum 2018 / Giza 2019)
9. During Mendel's experiments, he removed the stamens from the flowers before they become mature to prevent .... pollination, and he covered stigmas flowers to prevent .... pollination. (Sohag , Sharkia 2019)
10. The tall stem in a pea plant is .... trait, while the dwarf (short) stem is .... trait.
11. The contrasting trait of the green pod of pea plant is .... , while that of the white flowers is ....
12. The flower position in the pea plant is .... or ....
13. The yellow colour of .... of a pea plant dominates over the green colour, while the green colour of .... dominates over the yellow colour.
14. Each hereditary trait is controlled by two hereditary factors which separate during formation of the .... (Gharbia 2021 / Port Said 2019)
15. Mendel deduced that the hereditary traits are transmitted from parents to offspring by .... which are carried by gametes, the scientists later named them .... (Beni Suef 2011)
16. The two factors of hereditary traits are not similar in the .... individuals. (Kafr El-Sheikh 2018)
17. The scientist Mendel named the trait that appears in all individuals of the first generation as the .... trait, while the other (contrasting) trait that disappears in the individuals of the first generation as the .... trait. (Cairo 2018 / New Valley 2019)

18. The living organism that carries an impure trait is called ....
(Assiut 2018)
19. The scientist .... used the term .... instead of the hereditary factor.
(Fayoum 2015)
20. The .... individual is the one who carries a pair of similar dominant or recessive genes.
(Menofia 2016)
21. If (Y) letter symbol is the yellow colour of seeds and (y) letter symbol is the green colour of seeds, so the symbol of (Yy) represents the .... seeds and (yy) represents the .... seeds.
22. The individual carries .... gene(s) for each hereditary trait, while the gamete carries .... gene(s) for each hereditary trait.
(Beni Suef 2015)
23. Mendel's first law is called the law of .... and Mendel's second law is called the law of ....
(Menofia , Cairo 2021)
24. When two pure individuals bearing two pairs or more of the alternative traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of ....
(Gharbia , Suez 2015)
25. The Mendelian ratio for each pair of two pairs of inherited traits in Mendel's second law is ....
(Behira 2017)
26. By self-pollination of hybrid tall stem and red flowers of a pea plant, the ratio of the tall stem to the short stem is .... , while the ratio of red flowers to the white flowers is ....
27. The scientific idea of the dominance of the curly hair trait over the straight hair trait is .... (Ismailia 2017 / Gharbia 2018)
28. The ability to roll the tongue is one of the .... traits, while the straight hair is from the .... traits. (Gharbia 2021 / Cairo 2019)
29. The wide eyes trait is from .... traits, while the absence of check dimples trait is from .... traits.
30. The brown eyes trait is dominant over .... (Cairo 2021)
31. Chromosome is chemically composed of a nucleic acid called .... which is combined with .... (Giza 2021 / Luxor 2019)
32. The two scientists .... and .... were able to make a model for DNA molecule.
(New Valley 2011)
33. .... are parts of DNA which are present on the chromosomes and control the hereditary traits of the individuals. (Menofia 2018)
34. The two scientists .... and .... discovered the means of how the gene controls in the appearance of a trait. (Dakahlia 2018)
35. The .... is considered a part of DNA which consists of smaller structural units called .... (Sharkia 2018 / Dakahlia 2019)
36. Every gene gives a special .... which is responsible for the occurrence of a chemical reaction resulting in .... showing a specific hereditary trait. (Matrouh 2018 / Gharbia 2019)
37. Carotene substance is changed inside the body into vitamin .... , where its deficiency in the body may lead to ....

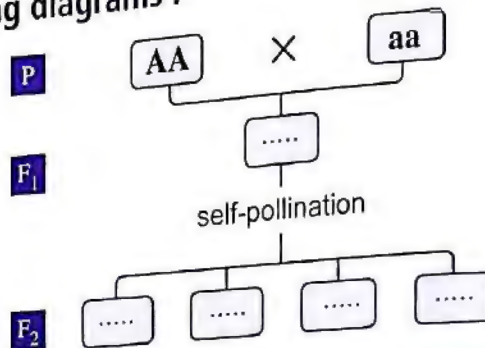
38. Rice does not contain pro-vitamin (A) which is known as .... and is converted into vitamin .... in the body.

39. The .... project discovered that more than .... % of the DNA is similar in humans. *(Damietta 2017 / Behira 2018)*

40. .... project is concerning about the effect of different mutations on the job of genes. *(Menofia 2013 / Behira 2019)*

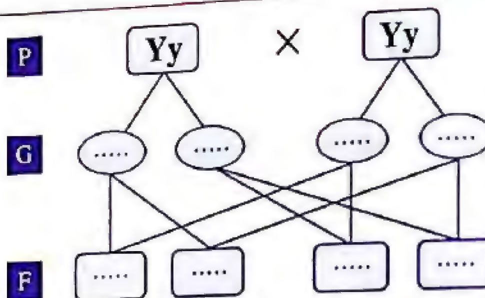
6. Complete the following diagrams :

1.



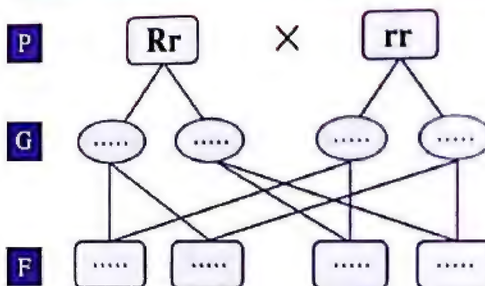
(Aswan 2011)

2.



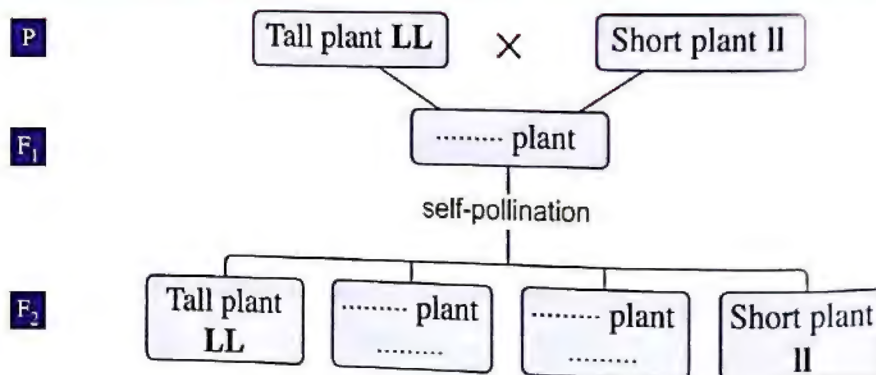
(Suez 2015)

3.



(Port Said 2012)

4.



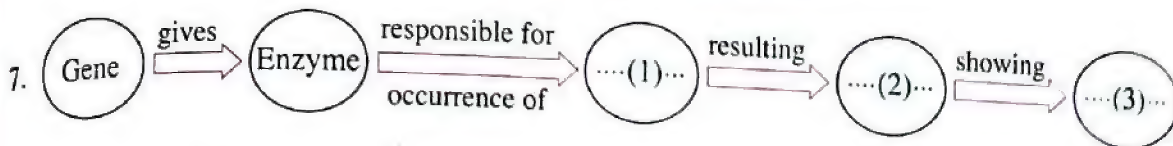
(New Valley 2011)

5.

♀ \ ♂	.....	Yr	yR	.....
yR	YyRR	....	....	....
.....	....	....	....	yyrr

6.

♀ \ ♂	RT	Rt	rT	rt
RT	....	....	....	....
Rt	....	....	....	....
rT	....	....	....	....
rt	....	....	....	....

7. 

7. Give reasons for :

1. Learn to walk in children is not considered a genetic trait. *(Menofia 2018 / Qalyoubia 2019)*
2. The skill of playing basketball isn't a hereditary trait. *(Sohag 2011)*
3. Mendel is considered as the founder of heredity.
4. 📖 Mendel selected (chose) the pea plant to conduct his experiments. *(Kafr El-Sheikh 2021 / South Sinai 2019)*
5. Mendel removed the stamens from the flowers of the plants before the anther becomes mature. *(Luxor 2016 / Dakhlia 2017 / Matrouh 2018)*
6. Mendel covered the stigmas of the pistils of pea flowers during studying the hereditary traits. *(Sohag 2017 / Gharbia 2019)*
7. Mendel let the pea plants self-pollinate for several generations. *(Dakahlia 2021 / Port Said 2015)*
8. Mendel's first law is known as the law of segregation. *(Behira 2016 / Dakahlia 2018)*
9. The disappearance of the green colour of the seeds in the first generation, by crossing of two pea plants, one pure green seeds and the other with pure yellow seeds.
10. 📖 When a pure yellow pod pea plant is pollinated with a pure green pod pea plant, they produce plants that all are with green pods. *(Menofia 2018 / Sharkia 2019)*
11. When you pollinate a pure tall stem pea plant with a short stem pea plant, they produce plants that all are tall stems. *(Beni Suef 2012 , 2013)*

12. When crossing between a plant of green seeds (recessive trait) with another of yellow seeds (dominant trait), the produced generation contains plants with green seeds. (Alex. 2015)
13. Crossing between dominant traits and recessive traits may give ratio 1 : 1 (Dakahlia 2015)
14. The recessive trait is always pure.
15. Some traits appear on offspring, but do not appear on their parents.
16. The curly hair trait dominates over the smooth hair trait. (Red Sea 2011)
17. If one individual inherited from one of his parents the gene that carries the curly hair trait, so this individual will be with curly hair. (Qalyoubia 2016)
18. 📖 The ability of rolling the tongue is a dominant trait in the human being. (Qena 2018 / Menia 2015)
19. The free ear lobe is dominant over the attached ear lobe. (Sohag 2019)
20. The wide eyes trait dominates over the narrow eyes trait in human. (Suez 2013 / Fayoum 2018)
21. It is possible for two parents have free ear lobe produce offspring have attached ear lobe.
22. Gene is responsible for the inheritance of the traits in living organisms. (Red Sea 2013)
23. The enzymes play an important role in the appearance of the hereditary traits. (Menofia 2016)
24. About 500.000 people every year are affected by losing their sight in developing countries.
25. Scientists are interested in creating genetically modified rice.
26. Some people who depend mainly on eating rice have deficiency in vitamin (A). (Menia 2015)

8. What is meant by...?

1. Genetics.
2. Hereditary traits. (Luxor 2016 / Giza 2018)
3. Acquired traits. (Port Said, Alex. 2021)
4. The principle of complete dominance. (Giving example) (Giza , Red Sea 2019)
5. Mendel's first law (Law of segregation of factors). (Sohag 2018 / Port Said 2019)
6. Gametes (Port Said 2021)
7. Dominant trait. (Menia 2013)
8. 📖 Recessive trait.
9. Hybrid individual. (Fayoum 2016)
10. Pure individual.
11. Mendel's second law (Law of independent assortment of hereditary factors). (Assiut 2021 / Sohag 2019)
12. 📖 The chromosome. (Behira 2021 / Beni Suef 2015)
13. 📖 The Gene. (Sharkia 2015 / Assiut 2018)
14. Human genome. (Menia 2018)

9. Mention the importance or use of :

1. Genes.
2. Human genome project. *(Behira , Gharbia 2021)*
3. Genetically modified rice. *(Menofia 2018 / Gharbia 2021)*

10. What happens when .... ?

1. The stigmas of the flower of pea plant uncovered during the study of the inherited traits. *(Gharbia 2021 / Aswan 2019)*
2. Mendel didn't remove the stamens of the flowers of the pea plant that produces yellow seeds. *(Matrouh 2012)*
3. Mating between two individuals, where one of them carries pure dominant trait, but the other carries pure recessive trait. *(Ismailia 2019)*
4. • Mating between two pure individuals different in two pairs or more of contrasting traits. *(Damietta , Behira 2021)*
   • Two pure individuals bearing two pairs of contrasting traits are crossed. *(Giza 2018)*
5. A dominant gene for one of the traits is present with another for the same characteristic. *(Qalyoubia 2018)*
6. A pea plant of short stem is pollinated by another of hybrid tall stem.
7. Pollination of peas flowers with hybrid yellow seeds with each other. *(Fayoum 2016)*
8. Cross-pollination takes place between two pure pea plants, one with a yellow pod and the other with a green pod. *(Fayoum 2017 / Giza 2019)*
9. A dominant gene exists with a recessive one. *(Dakahlia 2012)*
10. Mating between a pure pea plant having tall stem and red flowers and another having short stem and white flowers (according to the appearance of traits in the second generation).
11. Mating between two individuals, each of them has a pure trait of the ability to roll the tongue. *(Beni Suef 2017)*
12. The gene cannot produce its specific enzyme. *(Gharbia 2021 / Fayoum 2018)*
13. Dependence on rice as a main food.

11. Compare between :

1. The hereditary traits and the acquired traits. *(Suez 2021 / Qena 2019)*
2. 📖 The dominant trait and the recessive one. *(Dakahlia, Port Said 2018)*
3. The pure individual and the hybrid (impure) individual. *(Fayoum 2018)*
4. The dominant gene and the recessive gene. *(Menofia 2015)*
5. The wide eyes and the narrow eyes (concerning : the type of the hereditary trait). *(Aswan 2019)*
6. The black eyes and the narrow eyes (according to : the type of trait). *(Menia 2018)*
7. Ordinary rice and genetically modified rice (concerning : vitamins exist in both of them). *(Menofia 2018)*

12. Problems :

1. **Explain on genetic bases :** The properties of the produced generation from self-pollination in a pea plant that has hybrid yellow seeds, knowing that the dominant gene is symbolized by (Y) & the recessive one is symbolized by (y).
Mention the ratio of the produced individuals. *(Cairo 2017 , 2019)*

2. **Explain on genetic principles :** When pollinating flowers of a pea plant with each other, all the produced plants are of red hybrid flowers. *(Ismailia 2017 / Assiut 2018)*

3. Using symbols to express the results of mating between pure short stemmed pea plant (tt) and pure long stemmed pea plant (TT) showing first and second generations. *(Assiut , New Valley 2019)*

4. If crossing takes place between two pea plants, one with pure red flowers and the other with white flowers, explain on genetic bases the result of the crossing between one of the first generation with a plant of white flowers. *(New Valley 2017 , 2018 / Damietta 2019)*
N.B. : The red flower is symbolized by (R).
The white flower is symbolized by (r).

5. If crossing takes place between two pea plants, one of them with yellow seeds and the other with green seeds, this crossing produced 50 % yellow seeds and 50% green seeds.
Explain on genetic principles :
- The genetic structure of parents.
- The gametes forming first generation.
- The genetic structure of the produced generation. *(Qalyoubia 2017)*

6. Use the symbols (Tt) to express the results of the pollination between two hybrid (heterozygous) tall stem pea plants with each other. *(Matrouh 2018 / Alex 2019)*

7. Use the symbols to express the mating between two pea plants, one of them is hybrid red flowers and the other is white flowers. (knowing that the symbol of the dominant gene is (R) and that of the recessive gene is (r). *(Menofia , South Sinai 2019)*

8. **Explain on genetic bases :** The genetic composition of the parents and offspring that produced from crossing a pea plant of pure dominant yellow seeds with another with recessive green seeds. (Y dominant - y recessive). *(Cairo 2021 / Beni Suef 2018)*

9. **Use symbols to express the results from the pollination between :**
(a) White flowers pea plant with another pure red flowers pea plant. *(Qena 2018)*
(b) Long stem, green pods pea plant with another short stem, yellow pods.
(Showing parents, gametes, first generation and second generation in each crossing).

10. If you know that the free ear lobe (Y) is a dominant trait, while attached ear lobe (y) is a recessive trait, explain on genetic bases the traits of the offspring resulted from the crossing between man and woman both of them is hybrid for these traits (Yy). *(Dakahlia 2018 / Menofia 2019)*

11. **Explain on genetic bases :** The traits of the individuals resulted from mating hybrid black male mouse with hybrid black female mouse. If the black colour gene (B) dominates over the brown colour gene (b). *(Damietta 2018 / Fayoum 2019)*

12. If a black mouse BB is crossed with a brown female mouse (bb). Mention the colours and the ratios of resulting offspring in the first generation and second generation. Illustrate on hereditary bases. *(Damietta 2017 / Sharkia 2019)*

13. A pollination between a tomato plant of red fruits happened with another green, the resulting ratio were 50 % red fruits plants and 50 % green fruits plants, so explain on hereditary bases showing the ratio of the resulting individuals and characteristics. (Note that : symbol (R) refers to the gene of red fruits and symbol (r) refers to the gene of green fruits). *(Matrouh 2018)*

14. Using symbols to express the results produced from crossing between a pea plant with tall stem and green pod colour (TTGG) and another one with short stem and yellow pod colour (ttgg). [Illustrating : Parents - Gametes - First generation - Second generation in each crossing].

15. If crossing takes place between two pea plants, one of them with smooth yellow seeds (SSYY) and the other with wrinkled green seeds (ssyy). Explain on genetic principles the genetic structure for the first and the second generations.

16. Explain on genetic principles the genetic composition of the individuals resulting from crossing a pea plant with short stem (tt) and hybrid red flowers with another one hybrid tall stem and white flowers.
- The tall stem is symbolized by (T).
- The red colour is symbolized by (R) *(Port Said , North Sinai 2019)*

17. A man married a woman, each of them carries free ear lobe trait (impure).
What's the probability of the offspring that carry the recessive trait.
Explain this on genetic principles.
Knowing that the gene responsible for the free ear lobe is symbolized by (E).

18. Use the following symbols to show the results of the mixed-pollination between two pea plants where one carries two pure dominant traits, tall stem and red flowers (TTRR) and the other carries two recessive traits, short stem and white flowers (ttrr) [the first generation only]. *(Gharbia 2018)*

19. **Explain on genetic bases :** the traits of the individuals resulted from mating between man with curly hair (Hh) with a woman has smooth hair, show the genetic structure and the characteristics for each. *(Luxor 2017)*

20. Both Mohamed "blue eyes" and his wife Wafaa "blue eyes" fight with Samir "blue eyes" and his wife Soaad "brown eyes", on a child's attributions whose eyes is "brown". The judge issued his just judgment to any parents ? And write the reason. *(Menofia 2019)*

13. Variant questions :

1. Mention seven main traits of a pea plant, which Mendel used to conduct his experiments (which one is dominant and which one is recessive). (Behera 2015)
2. Mendel placed a group of assumptions (hypotheses) to explain the appearance of the dominant trait and the disappearance of the recessive trait in the first generation in the experiments that he carried with the pea plant. Explain these assumptions. (Luxor 2016)
3. **State the contributions (efforts) of the following scientists to science :** (North Sinai 2015)
   (a) Mendel. (Luxor 2016)
   (b) Watson and Crick. (Aswan 2017 / Port Said , Matrouh 2018)
   (c) Badel and Tatum. (Dakahlia 2015 / Port Said 2018)
4. Rasha agrees on the idea that says that her black cat can give birth with a white individual when it is crossed by a black male cat.
   Mariam refuses this idea. Which idea is correct ? Give a reason.
5. What is the result based on ? When two pea pure plants are crossed, one of them with long stem and red flowers (pure) and the other with short stem and white flowers for traits in the first generation plants. (Luxor 2012)
6. The pea plant has tall or short stems also it has red or white flowers. If (T) represents the tallness of stem and (R) represents the red colour of flowers, so what is the genetic structure of the following :
   (a) Hybrid tall stemmed and red flowered plant.
   (b) Short stemmed and white flowered plant. (Alex. 2017)
7. Mention an experiment to explain the law of independent assortment of the hereditary factors.
8. Explain Mendel's experiment to study the seeds colour trait in pea plant.
9. Mention the two laws of Mendel for heredity.
10. **What is the scientific idea of :**
    (a) The dominance of curly hair trait on the smooth one. (Aswan 2013)
    (b) The dominance of the presence of facial dimples trait on the absence of facial dimples trait.
11. **Mention the chemical structure of :**
    (a) Chromosome.
    (b) Nucleic acid (DNA).
12. **Which of the following human traits is dominant and which of them is recessive ?**
    (a) Attached ear lobe.
    (b) Wide eyes.
    (c) Curly hair. (Luxor 2017)

13. Explain :

(a) The model of Watson and Creek of the DNA structure. *(Port Said 2013 / New Valley 2019)*

(b) How the genes perform their functions ? *(Menia 2019)*

14. Mention the name of the scientists who have discovered the means of how the gene controls the appearance of a trait. *(Sharkia 2018)*

15. State the scientific basis of producing rice that contains pro-vitamin (A) [carotene]. *(Behira 2018)*

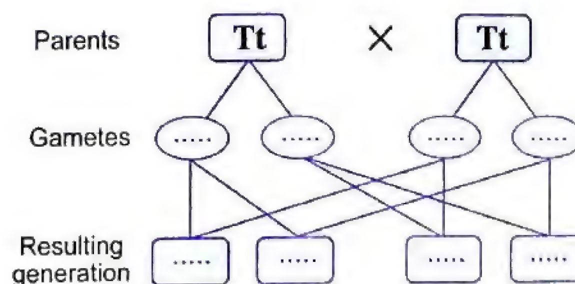
16. Mention the aims of the human genome project illustrating the resultants of this project.

Study the following figures, then answer the questions :

1. The figure in front of you illustrates self-pollination between two pea plants of hybrid tall stem (Tt).

(a) Determine the characteristics of the resulting generation.

(b) Mention the ratio between the dominant trait and recessive trait.



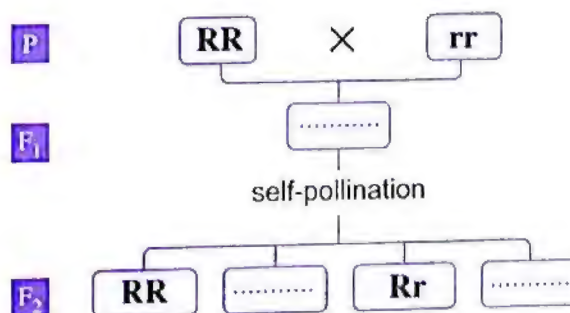
2. The opposite figure illustrates the mixed pollination between the red flower pea plant and white flower pea plant.

(a) Determine using symbols the individuals of the first generation.

(b) Complete the missing individuals of the second generation.

(c) Is the results verify Mendel's first law ? (Giving reason)

(d) Mention the reason of the disappearance of white flower plants in the first generation.



(New Valley , Ismailia 2018)

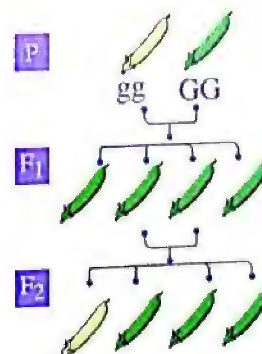
3. From the opposite figure, answer the following questions :

(a) What's the genetic structure of the pods of a pea plant in the first generation? What is the number of the plants which are symbolized by (GG) in the first generation?

(b) Which trait is dominant and which is recessive ?

(c) What is the number of plants which are symbolized by (GG) and (Gg) in the second generation ?

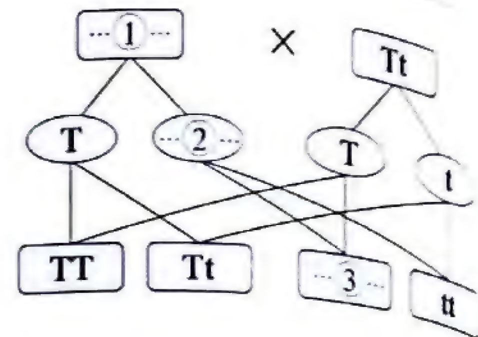
(d) Mention the number of each type in the second generation.



4. **The figure in front of you illustrates self-pollination between two pea plants of hybrid tall stem.**

(a) Complete the empty spaces in the opposite diagram. (Beni Suef 2019)

(b) Do the results apply Mendel's first law, why? (Menofia 2017)



5. A cross-pollination happened between two pea plants with end (aa), white (rr) flowers and others with side (AA), red (RR) flowers, and their offspring were self-pollinated. The ratios of the colour of the flowers and their position in the individuals of F_2 generation are different. Complete the table.

Male gametes / Female gametes	....	....	aR	....
AR	AARR	....	....	AaRr
....	....	AArr	....	Aarr
....	....	....	aaRR	....
....	....	....	....	aarr

6. **From the opposite figure :**

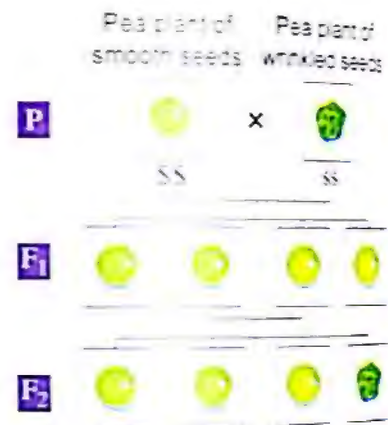
(a) Which of the two traits is dominant and which one is recessive ?

(b) Mention the genetic structure for individuals of the first generation.

(c) What are the traits of individuals of second generation ?
Mention the ratios of individuals.

(d) What is the percentage of plants whose genetic structure is ....

1. (ss) in the first generation.
2. (SS) in the second generation.
3. (Ss) in the second generation.

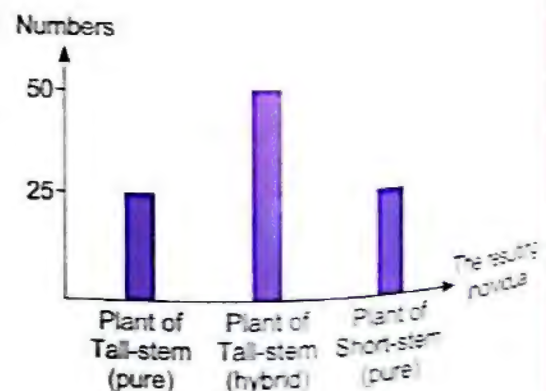


7. **From the opposite figure :**

represents the numbers result of the mating between two pea plants both are tall stem.

(a) Determine the characteristics of genetic structure of parents gametes ?

(b) Write the symbols to express this mating of the individual. (Menofia 2019)



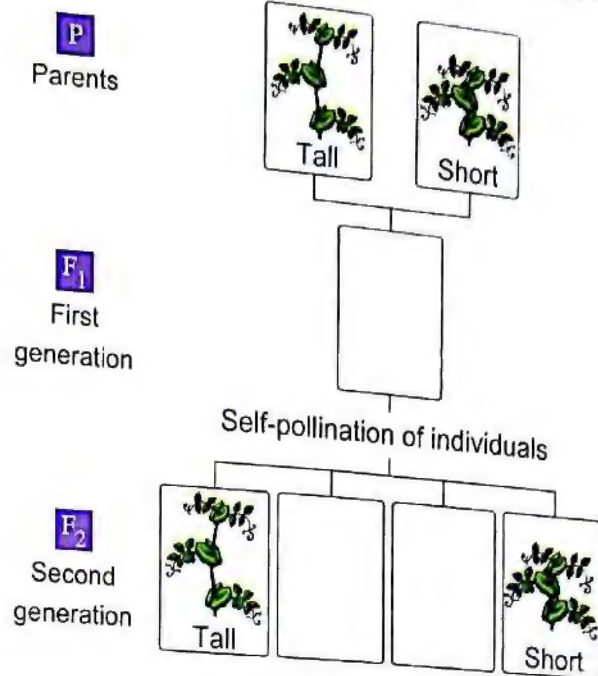
8. The figure in front of you illustrates the mixed pollination between the flowers of the short pea plant and another tall, both are pure plants.

(a) Determine the individuals of the first generation.

(b) Complete the missing individuals of the second generation and describe them.

(c) Use symbols to express the previous experiment.

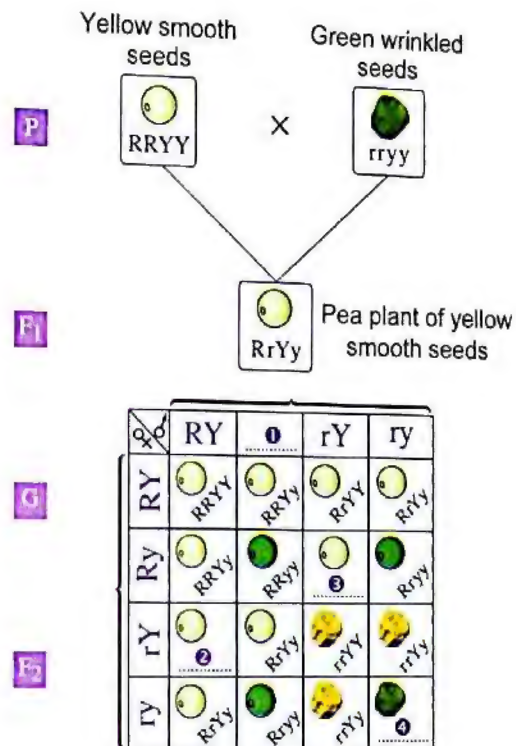
(Fayoum 2018)



9. The following figure illustrates the results of Mendel's experiment, where he pollinated a pea plant of yellow smooth seeds with green wrinkled seeds.

(a) Complete the missing parts in the figure.

(b) What's the name of the law which is concluded? State it.



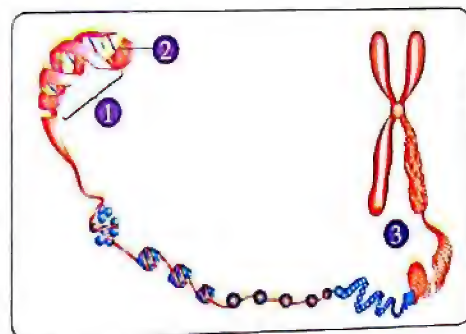
10. Study the opposite figure, then answer :

(a) Give the name for ❶, ❷ & ❸.

(b) Give the name of the structural units for number ❶.

(c) Give the name of the chemical structure for number ❸.

(Behira 2018)



Thinking Skills Questions

1. Explain on genetic bases :

The genetic structure of individuals produced from mating between a man with smooth hair and narrow eyes with a woman has curly hair and wide eyes (her mother with smooth hair and narrow eyes) and mention the ratio of the produced individuals knowing that :

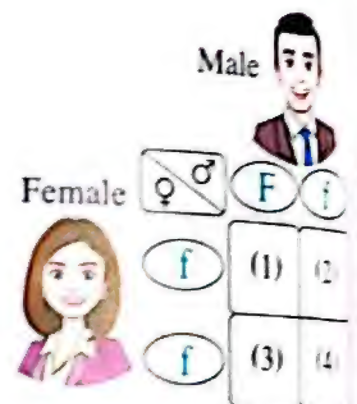
L : Symbol of wide eyes.

H : Symbol of curly hair.

2. Explain by genetic method, the hybridization in the Drosophila between a male and a female, each of them has long wings and the product is 27 members with long wings and 9 members with short wings. If you know that the symbol of long wing is (T) and short wing is (t).

(Behira 2018 , Ismailia ...)

3. The opposite figure shows the inheritance of facial freckles trait, if you know that the gene of absence of freckles trait is symbolized by (F) and the gene of presence of freckles trait is symbolized by (f). Answer the following questions :



1. Which of the two traits is dominant and which one is recessive ?
2. Mention the genetic structure of individuals from (1), (2), (3) and (4).
3. Mention the number which represents the genetic structure of.
   a. Hybrid individual.
   b. Pure individual.
   c. An individual carries the recessive trait.
4. Why the freckles do not appear on the face of father, although he carries one of his genes ?
5. Show by symbols the result of mating between the individual (1) with another individual has the same genetic structure.
6. If the individual (4) has light hair and is mated with a pure woman without freckles in the face and has black hair. Explain on genetic bases, the individuals of the produced generation.

Project On UNIT THREE

A project to develop the critical thinking "Distinguish between facts and non-facts"

• Put (✓) in front of statements that show facts, and (×) in front of the statements that show non-facts, with a scientific proof :

1. Playing football is one of the hereditary traits. ( )
....
2. Mendel's laws can be applied to all hereditary traits. ( )
....
3. All yellow seeds of pea plant carry the pure trait. ( )
....
4. Yellow pod colour is a concurrent trait to sinuous pod shape. ( )
....
5. The hereditary traits segregate in the reduction division. ( )
....
6. Long stem is one of the recessive traits in pea plant. ( )
....
7. Facial freckles is a hereditary trait that subjects to the principle of complete dominance. ( )
....
8. There is no relation between genes and enzymes. ( )
....
9. All agricultural crops can be subjected to genetic engineering. ( )
....
10. More than 99% of humans are similar in their DNA. ( )
....

UNIT

4 Hormones

The Lesson | Hormones in the Human Body.

Unit Objectives :

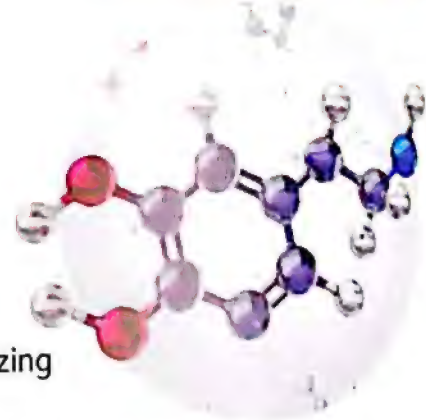
By the end of this unit, students will be able to :

- Identify the concept of hormone.
- Mention some hormones and their functions in human body.
- Identify some diseases resulted from hormone disorder in human body.

THE LESSON

Hormones in the Human Body

What is meant by hormones ?



- You learned from the previous studies that the nervous system organizes and coordinates both the activities and functions of the organs of living organisms.
- But , scientists through their experiments and researches proved that there is another form of organizing and coordinating of these activities and functions.
- This form is performed by chemical substances secreted by special cells in the body.
- These secretions, known as Hormones.

Hormone

It is a chemical substance (or a chemical message) that controls and organizes most of the vital activities and functions in the bodies of living organisms.

- Hormones are secreted in the body by some organs called "Endocrine glands or Ductless glands".

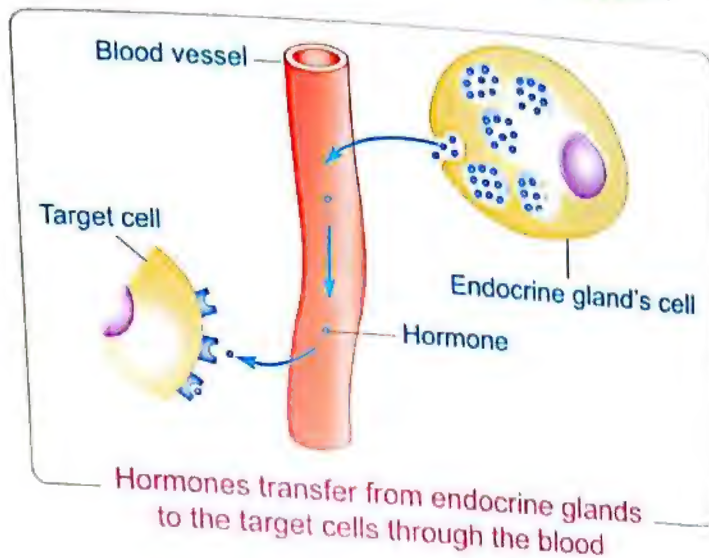
Endocrine glands

Endocrine glands

They are ductless glands that secrete their hormones directly in blood without passing through ducts.

• Blood is considered the only way for the hormones (which secreted by endocrine glands) to reach their sites of action (target cells). **G.R.**

Because the cells (which are known as target cells) that the hormones affect are almost located away from the endocrine gland that secretes the hormone.



Hormones transfer from endocrine glands to the target cells through the blood

Target cells

They are the cells that the hormones affect and they are almost located a way from the endocrine gland that secretes the hormone.

G.R. | ***The endocrine glands (ductless glands) are called by this name.***
Because they secrete their hormones directly in blood without passing through ducts.

Exercise 1

Choose :

1. The chemical substance that controls and organizes most of body vital activities is the ....
   a. protein. b. enzyme. c. hormone. d. endocrine gland.
2. The .... is the only way for hormones to reach their sites of action.
   a. enzyme b. lymph c. blood d. duct

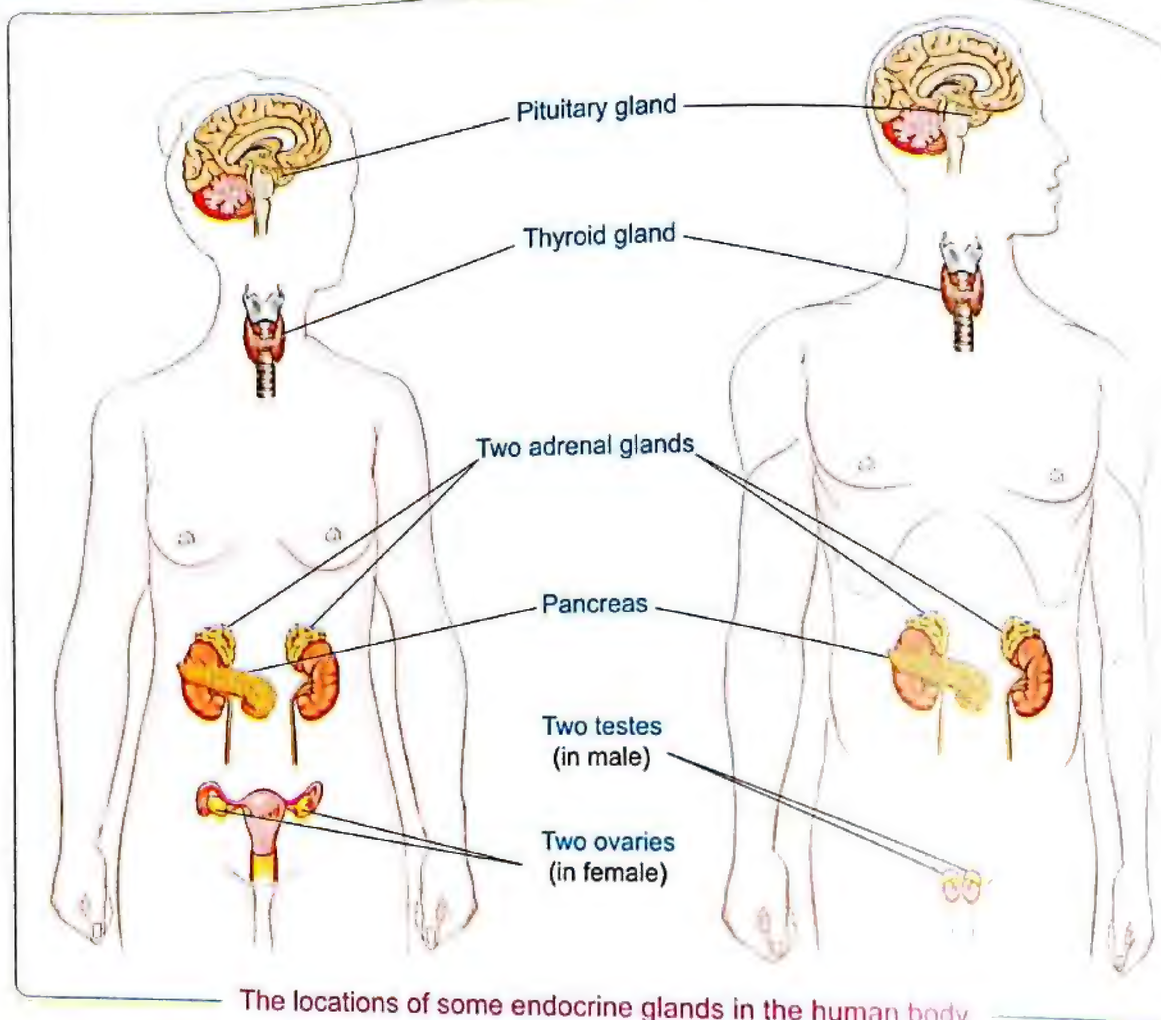
Answer

1. C. 2. C

The most important endocrine glands in the human body

1. Pituitary gland
2. Thyroid gland
3. Two adrenal glands
4. Pancreas gland
5. Reproductive glands
   - In male: Two testes
   - In female: Two ovaries

The following two figures show the most important endocrine glands in the human body :



The locations of some endocrine glands in the human body

- Endocrine glands secrete more than 50 hormones in the human body in limited quantities.
- On the occurrence of a disorder in the action of one of the endocrine glands, this affects the percentage of its secretion (by increasing or decreasing than the normal level) causing disease symptoms which is known as hormone disorder.

Hormone disorder

It is the increase or decrease in the secretion of one of the hormones, when the endocrine gland that secretes it doesn't act properly.

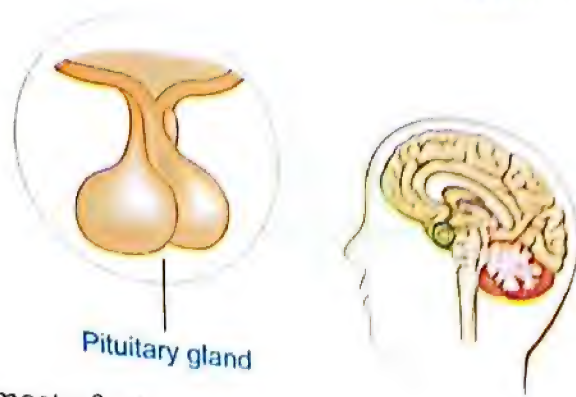
What happens if ...?

- **The percentage of the secretion of the endocrine gland increasing or decreasing than the normal level.**

➲ This causes disease symptoms which is know as hormone disorder.

1 Pituitary gland

- **Description :**
  - It is a small gland in the size of a pea seed.
  - It consists of two lobes.



- **Location :**

It is located below the brain.

- **Importance :**

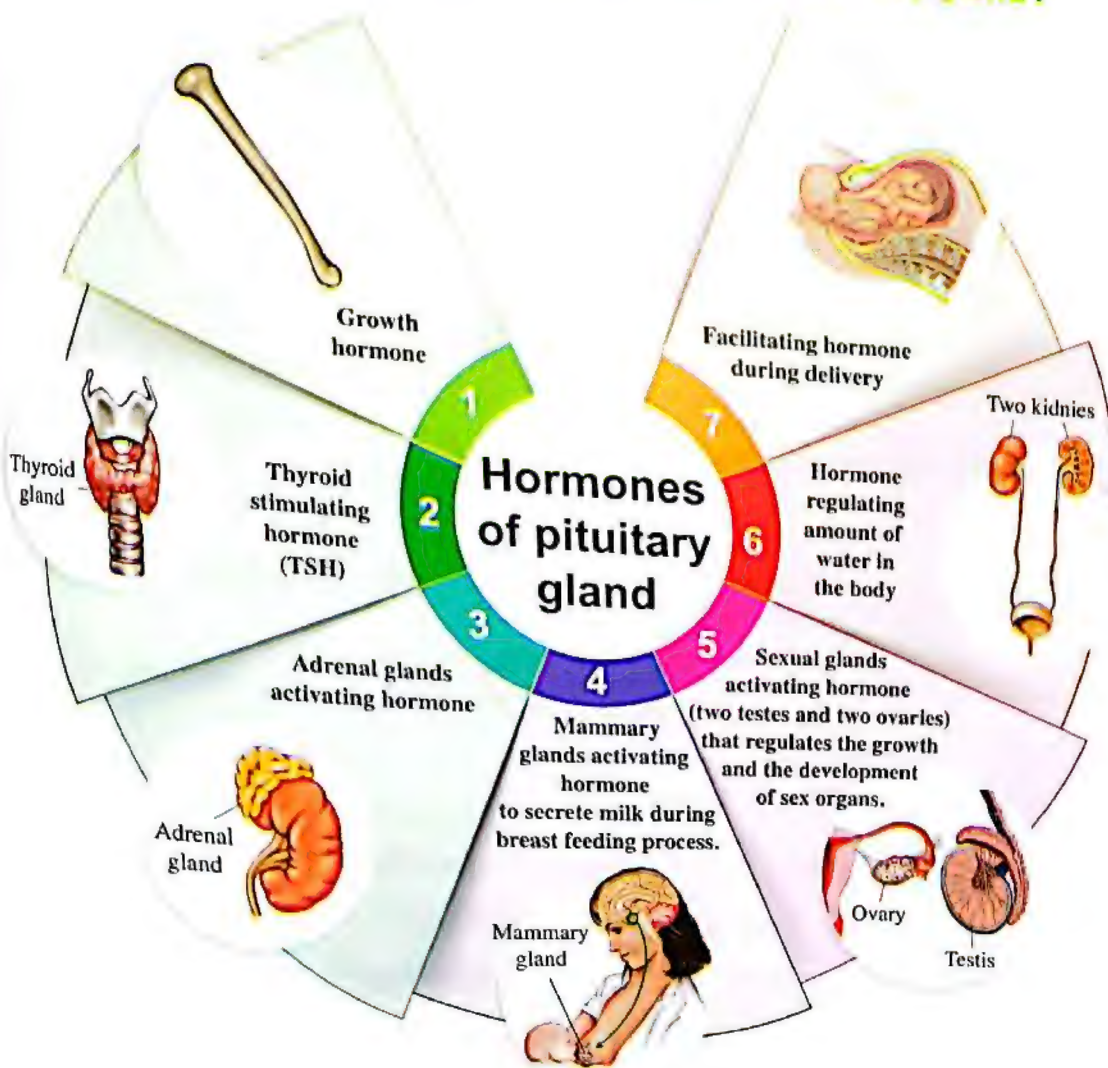
It secretes hormones that regulate the activities of most of other endocrine glands.
So, it is called the "master gland" or the "main gland".

- **Secretion :**

Each lobe of the two lobes of the pituitary gland secretes a group of different hormones.

G.R. The pituitary gland is called the master gland or the main gland.

- **The following diagram shows some hormones of the pituitary gland :**

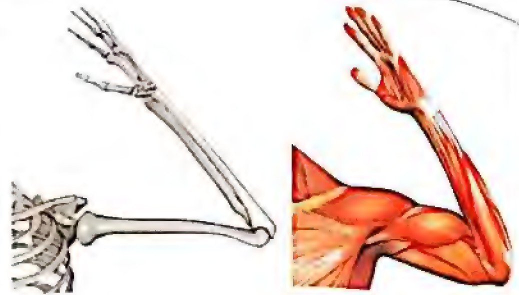


Growth hormone

Importance :

It controls the speed of growth rate of body muscles, bones and other organs.

, So It determines the height that the person will reach when he becomes a fully grown.



Growth hormone has an important role in the growth of the bones and the muscles

Some diseases resulted from the growth hormone disorder in the human body

	1 Dwarfism	2 Gigantism
Reason	Decrease in the secretion of the growth hormone at the childhood.	Increase in the secretion of the growth hormone at the childhood.
Feature of disorder	The body stops growing, so the person becomes a dwarf.	A continuous growth in the limbs' bones, so the person becomes a giant.

The tallest and smallest two men in the world.

What happens if ...?

- **The secretion of growth hormone is decreased in childhood ?**

  ➲ The body stops growing, so the person becomes a dwarf.

- **The secretion of growth hormone is increased in childhood ?**

  ➲ A continous growth in the limb' bones occurs, so the person becomes giant.

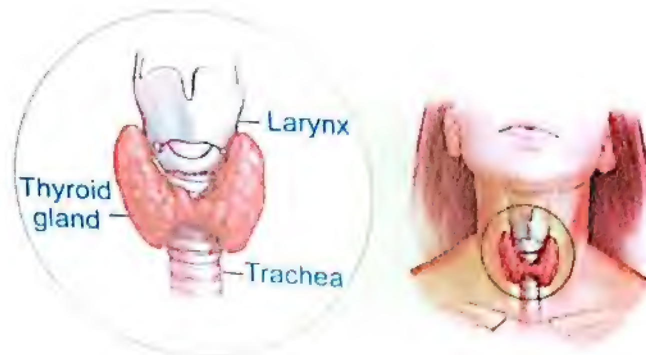
2 Thyroid gland

* **Description :**

It consists of two lobes, linked together by a small part.

* **Location :**

It is located in the front surface of the neck on both sides of the trachea.



* **Secretion :**

It secretes two hormones which are :

Its importance

Thyroxin hormone	Calcitonin hormone
It plays a main role in **food assimilation processes** in the body, where it liberates the energy necessary for the human body from food.	It controls the **Level of calcium** in blood.

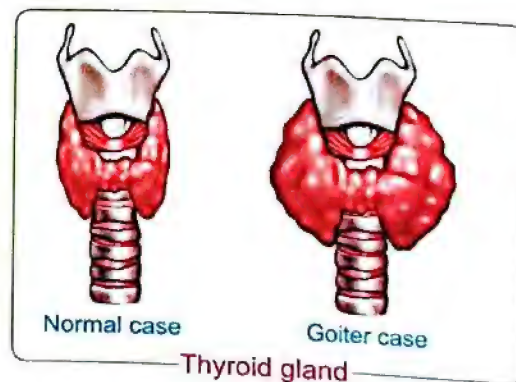
G.R. ***The food must contain iodine.***

Because iodine enters in the structure of thyroxin hormone which plays a main role in food assimilation processes in the body.

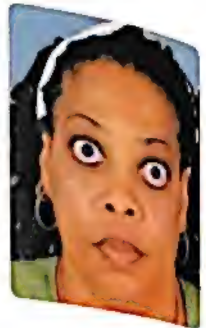
Some diseases resulted from the thyroxin hormone disorder in the human body

* **Features of disorder :**

On occurrence of a disorder in the secretion of the thyroxin hormone from the thyroid gland, this will lead to the goiter disease which has 2 shapes as follows :



Thyroid gland

1 Simple goiter		2 Exophthalmic goiter
Decrease in the secretion of the thyroxin hormone due to the lack of iodine from food as it enters in the hormone's structure.	**Reason**	Increase in the secretion of the thyroxin hormone in large amounts. 
Enlargement of thyroid gland and the neck.	**Symptoms of the disease**	Enlargement of thyroid gland accompanied by loss of weight, tension and exophthalmoses.

What happens when the deficiency of thyroxin hormone secretion ...?

➲ The human will suffer from simple goiter.

3 Two adrenal glands

* **Location :**

They are located adhering to the top of kidney.

* **Secretion :**

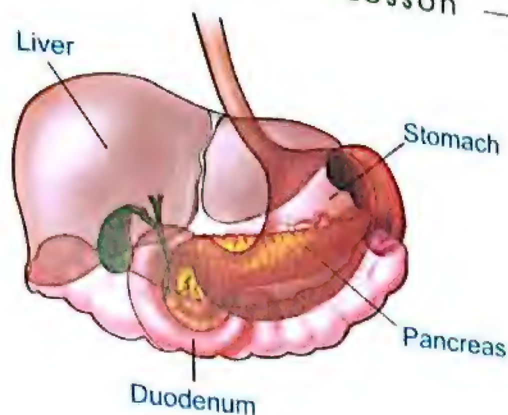
They secrete adrenalin hormone.

Adrenalin hormone	Its importance	It stimulates body's organs to respond to emergencies like : fear, anger and emotion

What happens when man is exposed to fear and horror ...?

➲ Pituitary gland responds by secretion of adrenal glands activating hormone, so these adrenal glands secrete adrenalin hormone which stimulates body's organs to respond to emergencies.

4 Pancreas gland



* **Location :**

It is located between the stomach and the small intestine.

* **Secretion :**

It secretes two hormones which are :

1 Insulin hormone	2 Glucagon hormone
Its importance	
It reduces the level of glucose sugar in blood.	It raises the level of glucose sugar in blood.
Thats occur by stimulating	
• Body cells to use glucose as a source of energy. • Liver cells to store excess glucose sugar in the body in the form of glycogen.	Liver cells to convert the stored glycogen into glucose sugar that releases into the blood stream to be available to body cells.

What happens when ... ?

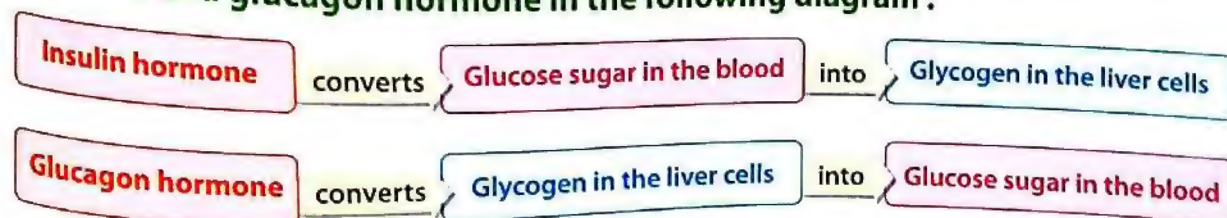
The level of glucose sugar in blood increases than the normal level.

➲ The pancreas gland will respond by secreting insulin hormone.

The level of glucose sugar in blood decreases than the normal level.

➲ The pancreas gland will respond by secreting glucagon hormone.

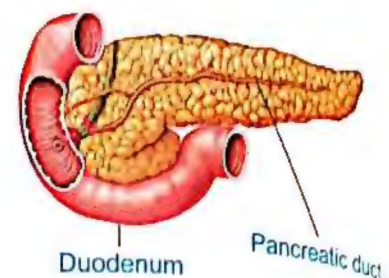
* **From the previous explanation, we can summarize the function of the insulin hormone and glucagon hormone in the following diagram :**



i.e. The function of the glucagon hormone contradicts the function of the insulin hormone.

G.R.

- ***Pancreas is a mixed gland.***
  Because the pancreas acts as a ductless gland which secretes the insulin and glucagon hormones directly to the blood (that regulate the glucose sugar level in the blood), and it also acts as a duct gland which secretes digestive juices to the pancreatic duct (that help in digestion process).

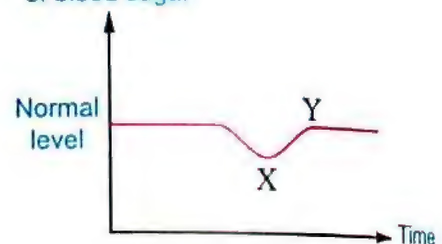


- ***Pancreas is a double function gland.***
  Because the pancreas secretes the insulin hormone and the glucagon hormone, and the function of each hormone contradicts the function of the other.

Exercise 2

Answer the following question :

From the opposite figure, what is the hormone which causes the change in the concentration (level) of the blood sugar from X to Y ?
And what is the gland that secrete this hormone ?



Answer

- The hormone is glucagon hormone.
- The gland which secretes this hormone is the pancreas.

Features of disorder in the secretion of insulin hormone

- On the occurrence of a disorder in the secretion of insulin hormone from the pancreas gland, this will lead to the infection with the diabetes disease.

Diabetes

It is a disease caused by the decrease in the secretion of the insulin hormone, which leads to increasing of the level of glucose sugar in blood and its existence in the urine.

Device used to measure immediately the concentration of glucose sugar level in blood.

* **Reason :**

Decrease in the secretion of the insulin hormone which leads to the cells are unable to use glucose.

* **Symptoms :**

Feeling very thirsty and multiple urination times.

5 Reproductive glands

1 Two testes glands

They secrete testosterone hormone.

Testosterone hormone	Its importance	It is responsible for the appearance of the male secondary sex characters.

2 Two ovaries glands

They secrete two hormones :

Its importance	
Estrogen hormone	It is responsible for the appearance of the female secondary sex characters.
Progesterone hormone	It promotes the growth of endometrium (The lining of uterus).

Enrichment information

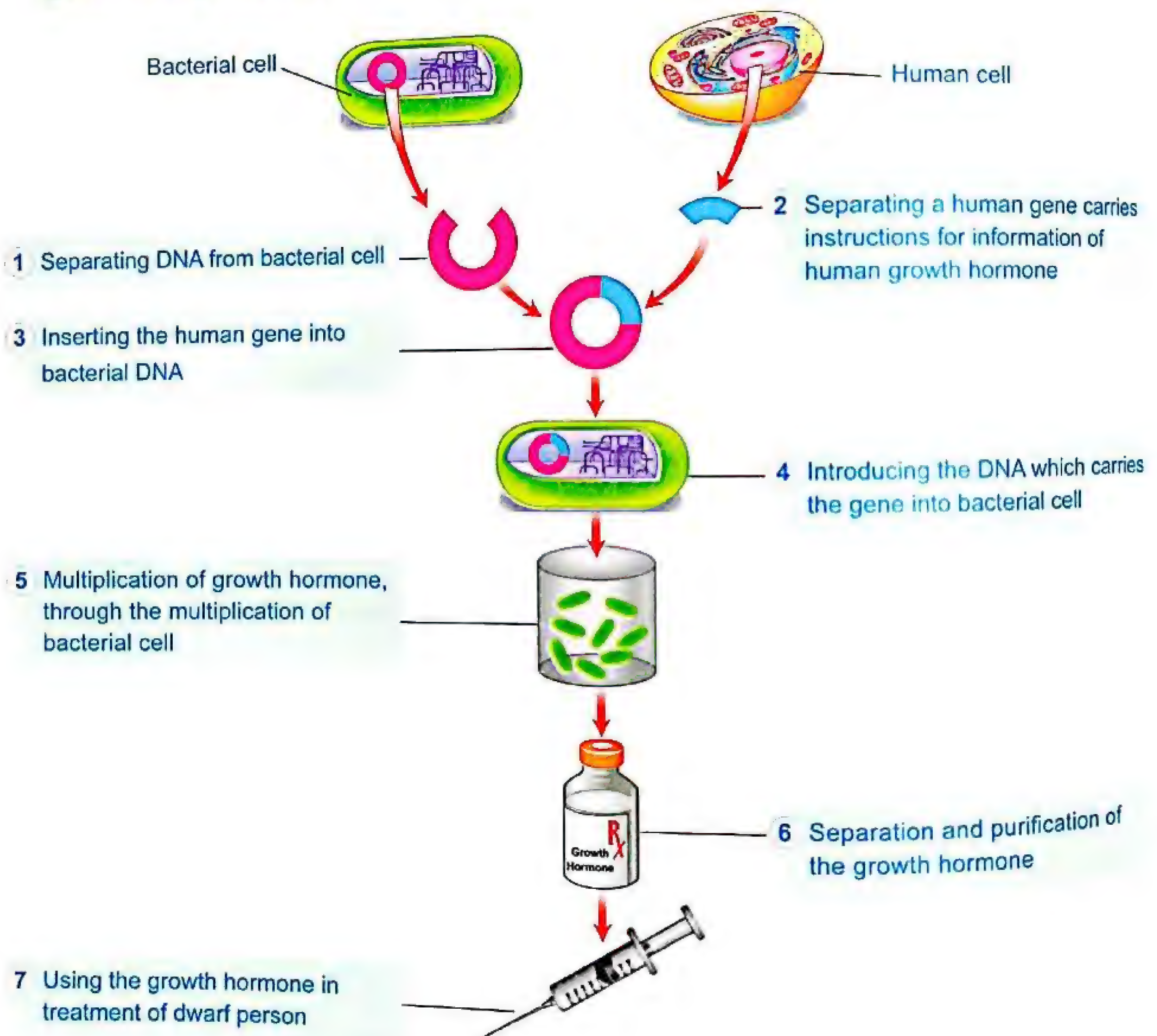
- *The female vocal cords produce voices more louder than those produced by male ones.*
- *This is because the sexual hormones in the mature male body cause an increase in the thickness of vocal cords, so the thin vocal cords in a female's larynx vibrate faster than the thick vocal cords in the male's larynx.*

Science, Technology and Society

- Pituitary gland in the body of dwarf persons secretes extremely small amounts of growth hormones.
- In the past, scientists treated these people by injecting them with human growth hormone extracted from the recently dead corpses of the childrens bodies.
- **But**, the amounts of growth hormone obtained by this method were extremely not enough in addition to the possibility of containing some microbes which may cause infection by various diseases.

- In 1979, by the genetic engineering technology, scientists manufactured sufficient amounts of human growth hormone by inserting a human gene that carries instructions for information of human growth hormone into DNA nucleic acid of the bacterial cells.
- In this way, they were able to produce and collect large amounts of the human growth hormone by great numbers of bacteria (in which this gene was inserted) then, this hormone was refined and tested.
- In 1985, the researches conducted on this hormone proved its validity for the human use to treat the children of the limited growth.

The following figure shows the steps of synthesis of growth hormone by genetic engineering :



We can summarize some hormones of endocrine glands and their functions in the following table :

Gland	Hormones	Functions
Pituitary	Growth hormone.	Promotes the growth of the body as a whole, where it controls the speed of growth rate of : - The muscles. - The bones. - Other organs.
	Thyroid stimulating hormone.	Stimulates thyroid gland to secrete thyroxin and calcitonin hormones.
	The activating hormones of sexual glands.	• Regulates the growth and the development of sex organs. • Activates the sexual glands to secrete their hormones prior to adulthood stage.
	Adrenal glands activating hormone.	Activates the two adrenal glands to secrete adrenalin hormone.
	Mammary glands activating hormone.	Activates the mammary glands to secrete milk during breast feeding process.
Thyroid	Thyroxin hormone.	Liberates the energy necessary for the body from food.
	Calcitonin hormone.	Controls the calcium level in the blood.
Adrenal	Adrenalin hormone.	Stimulates body organs to respond to emergencies.
Pancreas	Insulin hormone.	Stimulates the storage of glucose sugar in liver. (When the glucose level increases in the blood)
	Glucagon hormone.	Stimulates the release of glucose sugar from the liver. (When the glucose level decreases in the blood)
The two ovaries	Estrogen hormone.	Enables the female secondary sex characters to appear.
	Progesterone hormone.	Promotes the growth of endometrium.
The two testes	Testosterone hormone.	Enables the male secondary sex characters to appear.

TRY to answer worksheet 12

- General Exercise of the School Book on Unit 4
- Model Exams on Unit 4

in the Notebook

Remember The Lesson

Hormone :

It is a chemical substance (or a chemical message) that controls and organizes most of the vital activities and functions in the bodies of living organisms.

Hormones are secreted in the body by some organs called "Endocrine glands or ductless glands".

Endocrine glands secrete more than **50 hormones** in the human body.

Endocrine glands :

They are ductless glands that secrete their hormones directly in blood without passing through ducts.

Pituitary gland :

- It is located below the brain and it is a small gland in the size of pea seed (consists of two lobes).
- It is called master gland (main gland).
- It secretes group of hormones that regulate the activities of other endocrine glands and also secretes the **Growth hormone**.

- Dwarfism is a disease results due to the decreasing, in the secretion of growth hormone at the childhood, while, gigantism is a disease results due to increasing in the secretion of growth hormone at the childhood.

Thyroid gland :

It consists of two lobes and secretes **Thyroxin** hormone and **Calcitonin** hormone.

- The decrease in the secretion of thyroxin hormone causes **simple goiter disease**, while the increase in the secretion of thyroxin hormone causes **exophthalmic goiter disease**.

Adrenal glands :

They secrete **Adrenalin** hormone which stimulates body's organs to respond to emergencies.

Pancreas gland :

It secretes **Insulin** hormone in case of increase in sugar level in blood, and also secretes **Glucagon** hormone in case of decrease in sugar level in blood.

Diabetes :

It is a disease caused due to the decrease in the secretion of insulin hormone, which leads to increasing the level of glucose sugar in blood.

Reproductive glands :

Two testes secrete **Testosterone** hormone, while the Two ovaries secrete **Estrogen** and **Progesterone** hormones.

Questions on the lesson

Interactive Exercises

● Remember ● Understand ● Apply ● Higher skills 📖 School book questions.

1. Choose the correct answer :

1. The chemical substance that controls and organizes most of body vital activities is the .... *(Qalyoubia 2012)*
   a. protein. b. enzyme. c. hormone. d. endocrine gland.
2. Hormones are secreted from .... glands.
   a. sweat b. endocrine c. target d. mammary
3. The .... is the only way for hormones to reach their sites of action. *(Matrouh 2017)*
   a. enzyme b. lymph c. blood d. duct
4. Target cells are cells that .... *(Beni Suef 2017)*
   a. secrete the hormone. b. transfer the hormone.
   c. affected by the hormone. d. refuse receiving the hormone.
5. All of the following are considered from endocrine glands except .... gland.
   a. pituitary b. thyroid c. adrenal d. sweat
6. Pituitary gland is called the .... gland.
   a. activity b. master c. main d. (b) or (c)
7. All of the following are hormones secreted by pituitary gland except ....
   a. growth hormone. b. activating hormones of sexual glands.
   c. thyroid stimulating hormone. d. calcitonin hormone.
8. .... secretes facilitating hormone during delivery. *(El-Menia 2016)*
   a. The pituitary gland b. The ovaries c. The adrenal gland d. The thyroid gland
9. The disorder resulted due to the increase of secretion in the growth hormone at childhood is .... *(Dakahlia 2019)*
   a. gigantism. b. dwarfism. c. simple goiter. d. diabetes.
10. The hormone which determines the height that the person will reach at adulthood stage is .... hormone.
    a. thyroxin b. insulin c. testosterone d. growth
11. The endocrine gland that lies in the front surface of the neck on both sides of the trachea is the ....
    a. pituitary gland. b. thyroid gland. c. adrenal gland. d. pancreas.
12. The hormone which regulates the level of calcium in blood is the .... hormone.
    a. calcitonin b. thyroxin c. progesterone d. adrenalin
13. Calcitonin hormone is secreted from .... *(Giza , Red Sea 2019) (North Sinai 2012)*
    a. pancreas. b. thyroid gland. c. pituitary gland. d. parathyroid gland.

14. The .... hormone liberates the needed energy from the food stuff.
   a. growth b. estrogen c. thyroxin d. testosterone
   (Aswan , South Sinai 2019)

15. The disorder resulted from the increase of thyroxin hormone secretion in large amounts is the ....
   a. exophthalmic goiter. b. simple goiter.
   c. diabetes. d. dwarfism.

16. The hormone, whose deficiency causes the enlargement of the thyroid gland is .... (Giza, Gharbia 2017)
   a. estrogen. b. insulin. c. thyroxin. d. glucagon.

17. The hormone which stimulates the release of glucose sugar from liver is the .... hormone. (Assiut , New Valley 2019)
   a. growth b. insulin c. estrogen d. glucagon

18. The .... hormone stimulates the storage of glucose sugar in the liver.
   a. thyroxin b. insulin c. parathormone d. estrogen
   (Gharbia 2015 / Giza 2016)

19. Glucagon hormone is secreted by .... (Beni Suef 2011)
   a. pituitary gland. b. thyroid gland. c. adrenal gland. d. pancreas.

20. The adrenalin hormone which stimulates body organs to respond to emergencies is secreted from.......... (Cairo 2019)
   a. the two ovaries. b. the two testes. c. the adrenal gland. d. thyroid gland.

21. In an experiment, a resercher eradicates (removes) a pancreas from a rat. Which symptoms could appear on this rat .... (Menofia 2019)
   a. diabetes. b. exophathalmic goiter.
   c. gigantism. d. simple goiter.

22. Function of .... hormone is contradict the function of insulin hormone. (Ismailia 2019)
   a. testosterone b. glucagon c. adrenalin d. growth

23. Man suffers from .... disease when his food lacks iodine.
   a. dwarfism b. diabetes c. gigantism d. simple goiter

24. .... element shares in composing thyroxin hormone. (Behira, Ismailia 2015)
   a. Iodine b. Iron c. Sodium d. copper

25. Simple goiter occurs when the thyroxin hormone decreases due to the lake of .... in food. (Menofia 2016)
   a. iodine b. calcium c. potassium d. sodium

26. The hormone responsible for the appearance of male secondary sex characters is the .... hormone. (Cairo 2021 / Gharbia 2019)
   a. progesterone b. testosterone c. adrenalin d. growth

27. The hormone that promotes the growth of the endometrium is the .... hormone.
   a. growth b. insulin c. estrogen d. progesterone
   (Luxor 2019)

28. The gland(s) which secrete(s) testosterone hormone is/are called .... *(Sharkia 2013)*
a. pituitary gland. b. the two testes. c. thyroid gland. d. the two ovaries.

29. The hormone responsible for the appearance of the female secondary sex characters is the .... hormone. *(Beni Suef 2015 / Cairo 2016)*
a. parathormone b. estrogen c. insulin d. testosterone

2. Choose from cloumn (B) what suits it in column (A) :

1.

(A) [Hormone]	(B) [Function]
1. Growth	a. enables the male secondary sex characters to appear.
2. Thyroxin	b. stimulates the release of glucose sugar from liver.
3. Adrenalin	c. promotes the growth of endometrium.
4. Insulin	d. activates thyroid gland.
5. Glucagon	e. regulates the growth of the body as a whole.
6. Progesterone	f. stimulates body's organs to respond to emergencies.
7. Testosterone	g. stimulates the storage of glucose sugar in liver.
	h. liberates energy necessary for human body from food.

2.

(A)	(B)
1. Diabetes	a. is resulted from decreasing in growth hormone secretion at childhood stage.
2. Simple goiter	b. is resulted from decreasing in thyroxin hormone secretion.
3. Dwarfism	c. is caused by decreasing in insulin hormone secretion.
4. Exophthalmic goiter	d. is related to the increase in growth hormone secretion.
5. Gigantism	e. takes place due to the increase in thyroxin hormone secretion.
	f. appears as a result of decreasing in progesterone hormone secretion.

3. Put a sign (✓) in front of the correct statements and correct the false ones :

1. Hormones are secreted by the duct glands. *(Suez 2017)* ( )
2. Thyroid gland is known as the master gland. ( )
3. The endocrine glands secrete more than 50 enzymes in the human body. ( )
4. Pituitary gland secretes a hormone that organizes the general growth of the body. ( ) *(Sohag 2019)*
5. Thyroid gland secretes a hormone that organizes the growth and development of sexual organs in the human body. *(Red Sea , South Sinai 2013)* ( )
6. A person becomes giant on decreasing the secretion of growth hormone in childhood stage. *(Qalyoubia 2019)* ( )
7. In old age stage by decreasing of growth hormone causes dwarfism. *(Beni Suef 2017)* ( )

8. Dwarfism is the continual growth of human limb bones, so the person becomes a giant. (South Sinai 2016) ( )
9. 📖 The calcitonin hormone controls the level of calcium in the human body. (Giza 2021) ( )
10. Pancreas plays an important role in controlling the level of glucose sugar in blood. ( )
11. 📖 The glucagon hormone is secreted by pituitary gland. (Qena 2015 , 2019) ( )
12. Thyroid stimulating hormone is secreted from the pituitary gland. ( )
13. 📖 The iron element shares in composing thyroxin hormone. (Giza 2012 , 2013) ( )
14. The decrease in secretion of insulin hormone causes diabetes disease. ( )
15. The adrenal gland secretes parathormone hormone which stimulates body's organs to respond to emergencies. (Damietta 2011) ( )
16. Exophthalmic goiter is resulted due to thyroxin hormone deficiency. (Fayoum 2012) ( )
17. Progesterone hormone makes the male secondary sex characters appear. (Luxor 2013) ( )
18. Estrogen hormone promotes the growth of endometrium. (New Valley 2017) ( )

4. Write the scientific term :

1. • 📖 Organs secrete hormones in the human body. (Qena , Luxor 2019)
   • They are ductless glands that secrete their hormones directly in the blood without passing through ducts. (Cairo , Gharbia 2021)
2. 📖 A chemical message that controls and regulates the activities and functions of most of the body organs. (Beni-Suef 2021 / Red Sea 2019)
3. The only way for hormones to reach their sites of action.
4. They are the cells that the hormones affect and they are almost located away from the endocrine gland that secretes the hormone. (Behira 2019)
5. The disorder that occurs due to abnormal working of the endocrine glands. (Menofia 2016)
6. • The endocrine gland that is called the master gland.
   • A gland located below the brain and it consists of two lobes, each one secretes various types of hormones.
   • 📖 A gland secretes a hormone that regulates the growth of the human sexual organs. (Kafr El-Sheikh 2015 / Gharbia 2016)
7. The gland responsible for secreting a hormone, that keep water balance in the body. (New Valley 2021 / Menofia 2019)
8. A hormone which controls the speed of growth rate of body muscles and bones. (Alex. 2017)
9. A hormone disorder caused by the decrease in secretion of the growth hormone at the childhood. (Ismailia 2019)
10. A hormone disorder caused by the increase in secretion of the growth hormone at the childhood.
11. The endocrine gland that lies in the front surface of the neck on both sides of the trachea.
12. The hormone which controls the level of calcium in the blood.
13. The hormone that stimulates body organs to respond to emergencies. (Fayoum 2012)

14. • The hormone which plays a main role in food assimilation processes in the body.
    • The hormone which liberates energy necessary for the body from food.
15. The disease caused by the increase in the secretion of thyroxin hormone. (North Sinai 2019)
16. The disease caused by the decrease in the secretion of thyroxin hormone.
17. The element that enters in the composition of thyroxin hormone.
18. The endocrine gland that secretes hormones regulate glucose sugar level in the blood.
19. The hormone which stimulates the storage of glucose sugar in liver. (Beni Suef 2011)
20. • A hormone which stimulates the release of glucose sugar from the liver. (Ismailia 2012)
    • A hormone when it increases in blood, it causes an increase in the percentage of glucose in blood. (Behira 2013)
21. A disease caused by the decrease in the secretion of the insulin hormone. (Gharbia 2013 , Ismailia 2016)
22. The gland which secretes adrenalin hormone which stimulates body's organs to respond to emergencies. (Aswan 2015)
23. A hormone which makes the female secondary sex characters appear. (Cairo, Ismailia 2015)
24. A hormone which promotes the growth of endometrium. (Alex. 2021)
25. A hormone responsible for the appearance of the male secondary sex characters. (Cairo , El-Menia 2019)
26. 📖 The result when one of the endocrine glands does not act properly. (Sharkia 2017 , Fayoum 2016)

5. Complete the following sentences :

1. 📖 The chemical substance that controls and regulates the functions of most of body organs is known as ....
2. 📖 Hormones are directly secreted into the blood stream by .... (Fayoum 2016 , Suhag 2017)
3. Hormones cooperate with .... for organizing body activities.
4. .... is the only way for reaching the hormone to the .... cells.
5. Endocrine glands secrete more than .... hormones in the human body.
6. ...., ... and two adrenal glands are from examples of endocrine glands.
7. Below the brain, there is a small gland called .... , and in spite of its small size it is called .... or .... (Dakhalia 2017 , El-Menia 2019)
8. On reaching adulthood stage, ... glands are activated by hormones secreted from pituitary gland.
9. .... gland secretes .... hormone which controls the general growth of the body. (Cairo 2021 , Giza 2019)
10. Deficiency of .... hormone during .... stage causes dwarfism. (Suez 2016)
11. 📖 When the secretion of the growth hormone decreases in childhood, man suffers from .... (Cairo, Gharbia 2016)
12. .... gland consists of two lobes and located in the front surface of the neck, and it secrets .... hormone. (Kafr El-Sheikh 2021 / Dakahlia 2019)

13. Thyroid gland secretes two hormones called .... and .... *(Damietta , Fayoum 2019)*
14. 📖 Thyroxin is a .... that regulates food assimilation in your body. *(Ismailia 2019)*
15. .... hormone controls the level of calcium in the blood. *(Sohag , Gharbia 2019)*
16. The decrease in thyroxin hormone due to lack of iodine from food causes ...., while the excess secretion of this hormone causes ....
17. 📖 When the amount of iodine decreases in the food, the secretion of the .... hormone decreases from .... gland. *(Sharkia , Damietta 2021)*
18. .... hormone stimulates body organs to respond to emergencies and it is secreted from .... glands. *(Behira 2016 / Beni Suef 2019)*
19. .... is from symptoms of exophthalmic goiter disease, while .... is from symptoms of simple goiter disease.
20. Pancreas is located between the .... and ....
21. 📖 When the amount of glucose sugar decreases in blood, pancreas secretes .... hormone. *(Menofia 2016 / Giza 2017)*
22. .... hormone is secreted by pancreas to rise the glucose level in blood. *(Damietta 2021)*
23. Glucagon sitmulates the release of .... from the liver. *(New Valley 2017)*
24. 📖 .... hormone is secreted when the percentage of glucose sugar increases in the blood. *(Aswan 2015 / Sohag 2016)*
25. When glucose level is increased in blood, the pancreas secretes .... hormone which stimulates the body cells to use .... from the blood. *(Cairo, Kafr El-Sheikh 2017)*
26. Deficiency of insulin hormone secretion causes ....
27. .... hormone responsible for the appearance of the female secondary sex characters, while .... hormone responsible for the appearance of the male secondary sex characters. *(Qalyoubia 2013 / Ismailia, Giza 2016)*
28. .... hormone promotes the growth of endometrium.
29. The case in which endocrine glands do not work properly is known as ....

6. Give reasons for :

1. Hormones are secreted in the body by some endocrine (ductless) glands. *(Cairo 2019)*
2. Blood stream is the only way for hormones to reach their sites of action. *(Damietta , New Valley 2019)*
3. 📖 Pituitary gland is called the master gland. *(South Sinai , North Sinai 2019)*
4. The pituitary gland plays an important role in delivery and breast feeding processes.
5. • 📖 The height of some persons may reach 2 metres. *(Assiut 2016)*
   • The limb's bones of some people grow continuously, so they become giants. *(New Valley 2019)*
6. • 📖 The height of some persons may reach less than half metre.
   • The stopping of the body growth, so the person becomes a dwarf. *(Dakahlia 2021)*
7. Iodine salt is preferred than the normal salt. *(Ismailia 2016)*
8. The food must be contained iodine.
9. Some persons have enlarged thyroid gland.

10. Man suffers from simple goiter disease. *(Fayoum 2019)*
11. Thyroid gland plays an important role in controlling the level of calcium in the blood. *(Kafr El-Sheikh 2013)*
12. The two adrenal glands have an important role when man is exposed to emergency. *(Gharbia 2013 / Menofia 2017)*
13. Pancreas is a mixed gland.
14. Pancreas is a double function gland. *(Damietta 2017 / El-Menia 2019)*
15. The secretion of glucagon hormone increases when the percentage of glucose sugar decreases in blood. *(El-Menia 2016)*
16. The secretion of insulin hormone increases when the percentage of glucose sugar increases in blood.
17. Diabetes is treated with insulin hormone.

7. What is meant by ... ?

1. Hormones. *(Assiut 2021 / Sohag 2019)*
2. Endocrine glands (ductless glands).
3. Target cells.
4. Hormone disorder.
5. Dwarfism. *(Qalyoubia 2016 / Menofia 2017)*
6. Gigantism.
7. Simple goiter. *(Qalyoubia 2016)*
8. Exophthalmic goiter.
9. Diabetes. *(Dakahlia, Sohag 2017)*

8. What would happen ... ?

1. Decreasing the activity of pituitary gland in the body. *(Dakahlia 2019)*
2. When the deficiency of growth hormone secretion at childhood. *(Luxor 2021 / Red Sea 2019)*
3. If the secretion of growth hormone is increased in childhood. *(New Valley 2017)*
4. To the human as thyroxin hormone secretion increases. *(Dakahlia, Suez 2016)*
5. When the deficiency of thyroxin hormone secretion. *(South Sinai, Sharkia 2016)*
6. When man takes a little amount of iodine in his food. *(Qalyoubia 2017, 2019)*
7. • When man is exposed to emergency. *(Cairo 2013)*
   • The man is exposed to fear and horror. *(Menofia 2015)*
8. To blood sugar level when pancreas does not secrete glucagon hormone. *(Aswan, Fayoum 2017)*
9. When glucose sugar level is decreased in blood. *(Cairo 2021)*
10. If the pancreas decreases its secretion of the insulin hormone.
11. If the pancreas stopped its secretion of the glucagon hormone. *(Fayoum 2019)*
12. When glucose sugar level is increased in blood. *(Behira 2021)*
13. When testosterone hormone does not secreted in adulthood stage in a male human.
14. When estrogen hormone doesn't secreted in adulthood stage in a female.
15. Insert a human gene that carries instructions for the formation of a human growth hormone into DNA of the bacterial cells. *(Behira 2016 / Menofia 2017)*

9. Mention the role or the function of each of the following :

1. Hormones.
2. Endocrine glands. (Suez 2021)
3. Pituitary gland. (Sharkia 2017)
4. Growth hormone. (Assiut 2015)
5. Mammary glands activating hormones.
6. Activating hormones of sexual glands.
7. Thyroid stimulating hormone.
8. Thyroid gland.
9. Thyroxin hormone. (Behira 2019)
10. Iodine salt. (Red Sea 2017 / Luxor 2019)
11. Calcitonin hormone. (El-Menia 2021 / Kafr El-Sheikh 2017)
12. Adrenalin hormone in human body.
13. Pancreas.
14. Insulin hormone. (Red Sea 2021 / Sohag 2019)
15. Glucagon hormone. (El-Menia 2021)
16. Estrogen hormone. (Qena 2019)
17. Progesterone hormone. (Alex. 2017)
18. Testosterone hormone.

10. Compare between :

1. Pituitary gland and thyroid gland (according to their function only). (Beni Suef 2011)
2. Dwarfism and gigantism (according to the reason). (Port Said 2021 / Luxor 2019)
3. Simple goiter and exophthalmic goiter related to its symptoms. (Dakahlia 2019)
4. Insulin and glucagon hormones. (Qalyoubia 2016)
5. Thyroxin hormone and calcitonin hormone. (according to their function). (Cairo 2019)
6. The exophthalmic goiter and diabetes (concerning : the reasons and symptoms). (Alex. 2017)
7. Progestrone hormone and testosterone hormone (according to their importance). (Fayoum 2019)
8. Testes and ovaries (from the point of the produced hormones and the function). (Fayoum 2017 / Beni Suef 2019)

11. Mention the disease or the disorder results due to :

1. The decrease in growth hormone secretion in childhood stage.
2. The increase in growth hormone secretion in childhood stage. (Ismailia 2013)
3. The decrease in thyroxin hormone secretion.
4. The increase in thyroxin hormone secretion. (Ismailia 2013)
5. The insulin hormone deficiency. (Sohag 2012)

12. Mention the name of the hormone which is responsible for each of the following :

1. Regulating the growth of the body as a whole.
2. Stimulating thyroid gland to secrete its hormones.
3. Affecting the development of sex organs prior to adulthood stage.
4. Liberating the energy necessary for the body from food. (Menofia 2019)
5. Controlling the calcium level in the blood.
6. Stimulating body organs to respond to emergencies.
7. Stimulating the storage of glucose sugar in liver.

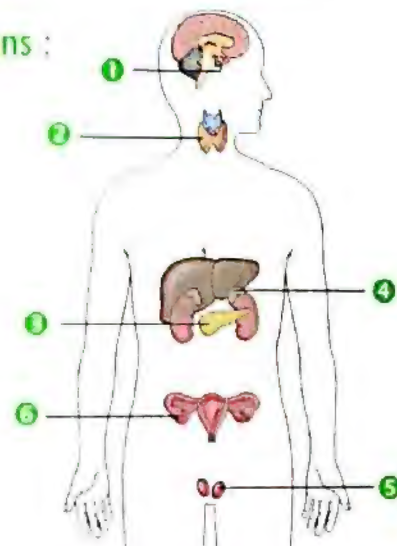
8. • Stimulating the release of glucose sugar from the liver.
   • Converting glycogen in the liver into glucose sugar in the blood.
9. Appearing the female secondary sex characters. *(Beni Suef 2019)*
10. Promoting the growth of endometrium. *(North Sinai 2012)*
11. Making the male secondary sex characters appear. *(Menofia 2019)*

13. Variant questions :

1. Write short notes about hormones and their functions.
2. Mention the important endocrine glands in the human body.
3. Mention the sites or locations of the following endocrine glands in the human body :
   (a) Thyroid gland. (b) Pituitary gland.
   (c) Adrenal glands. (d) Pancreas.
4. Explain scientifically :
   (a) Dwarfism phenomena in human being. *(Beni Suef 2011)*
   (b) Gigantism in human being.
   (c) Simple goiter in human being.
   (d) Exophthalmic goiter in human being.
   (e) Diabetes in human being.
5. Show how the scientists used the bacterial cells for the creation of growth hormone.

14. Study the following figures, then answer the questions :

1. The following figure shows some endocrine glands in the human body.



(a) Label the fig. *(Aswan 2019)*

❶ ....
❷ ....
❸ ....
❹ ....
❺ ....
❻ ....

(b) Mention the number of the figure that indicates each of the following statements :

a. The gland which secretes growth hormone. ( )
b. The master gland. ( )
c. The gland which secretes enzymes and hormones. ( )
d. The gland that controls the secretion of gland number (5). *(Damietta 2011)* ( )
e. A gland, whose hormone controls the level of calcium in blood. ( )
f. The gland which secretes a hormone stimulates body organs to respond to emergencies. ( )

g. The gland which secretes hormones regulate the amount of glucose sugar in blood. ( )

h. The two glands that does not exist in the same body. *(Damietta 2011)* ( )

2. Look at the opposite fig., then answer the following questions :

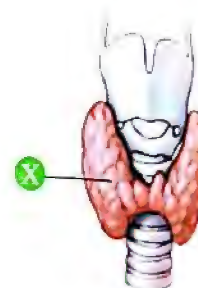
(a) The fig. represents .... gland that it is located below ....

(b) It secretes .... that regulate the activities of other endocrine glands, so it is called .... or ....

(c) It consists of ...., each one secretes various types of hormones.

(d) It secretes .... hormone which controls the speed of growth rate of body muscles, bones and other organs.

3. From the opposite fig., answer the following questions :



(a) What is the name of the gland (X) ?

(b) Mention the most important secretions of this gland.

(Qena 2013)

4. From the opposite figure, answer the following questions :

(a) What is the name of this disease ?

(b) Describe the features of this disease.

(c) Mention the cause of this disease.

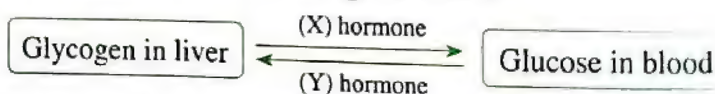
5. Look at the opposite fig., then answer the questions :

(a) The opposite apparatus is used in ....

(b) What happens to the reading of this apparatus when ...?

1. The secretion of insulin hormone increases than its normal level.
2. The secretion of insulin hormone decreases than its normal level.
3. The secretion of glucagon hormone decreases than its normal level.

6. Study the following, then answer the questions :

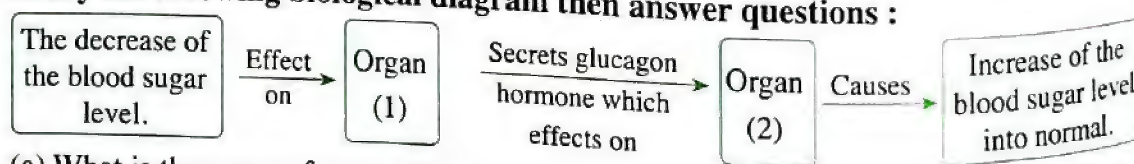


(a) Mention the name of hormones (X) and (Y).

(b) When hormone (Y) is secreted ? and what is the name of gland which secretes it ?

(Damietta 2016)

7. Study the following biological diagram then answer questions :



(a) What is the name of organ (1) ?

(b) What is the name of organ (2)?

Thinking Skills Questions

1. Choose the correct answer :

1. The person who suffereing from loss of weight, thats may be due to ....
   (a) dwarfism. (b) decrease in the secretion of calcitonin hormone.
   (c) exophthalmic goiter. (d) decrease in the secretion of thyroxin hormone.

2. Sever damage of .... gland, may causes death.
   (a) parathyroid (b) thyroid (c) ovary (d) pituitary

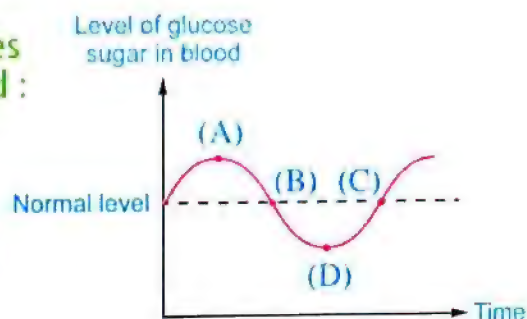
3. The hormone which its secretion increases in the teenagers is ....
   (a) adrenal glands activating hormone.
   (b) the hormone regulating amount of water in the body.
   (c) calcitonin hormone.
   (d) testosterone or estrogen hormone according to the sex.

4. The effect of the decrease of glucagon hormone secretion, is similar to ....
   (a) the decrease in insulin hormone secretion.
   (b) the increase in insulin hormone secretion.
   (c) the decrease in calcitonin hormone secretion.
   (d) the increase in calcitonin hormone secretion.

2. The opposite graph represents some changes in the level of glucose sugar in human blood :

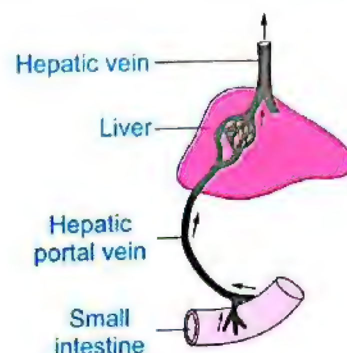
Write the name of the hormone which changes the state from (A) to (B) and from (D) to (C).

(Behira 2016)



3. Blood carries glucose sugar from small intestine to the liver through hepatic portal vein to be stored in the liver as glycogen then passes through hepatic vein to the heart.

Which vein contains blood carries 30 mg glucose, and which one carries 100 mg glucose.



4. Give a reason for :

People live in coastal regions will not suffer from the simple goiter.

Project
On UNIT FOUR

A project to develop the creative thinking
"Achieve creative results"

* **Complete the following statements :**

1. If there is no salivary glands on both sides of mouth, then ....

2. If the prostate gland doesn't secrete prostate fluid, then ....

3. If there is no sweat glands, then ....

4. If the secretion of insulin hormone increases, then this leads to ....

5. If the frontal lobe of the pituitary gland doesn't secrete mammary glands activating hormone, then ....

6. If the adrenalin hormone secretion increases even by a small amount, then this leads to ....

7. If the ovary doesn't secrete progesterone hormone during all the pregnancy time, then ....

8. If the blood glucose level increases and the liver or muscles cannot store it, then this leads to ....

9. If there is no iodine in food, then ....

10. If a dwarf child injected with the growth hormone, then ....

Glossary

Unit 1

Lesson 1

chemical reactions	تفاعلات كيميائية
car engine	محرك السيارة
generate	يولد
medicine	أدوية
fertilizers	أسمدة
artificial fibers	ألياف صناعية
breaking up	كسر
bond	رابطة
reactants	متفاعلات
resultants (products)	نواتج
thermal decomposition reactions	تفاعلات الانحلال الحرارى
extinguish	يطفئ
substitution reactions	تفاعلات الإحلال
chemical activity series	متسلسلة النشاط الكيميائى
pop sound	صوت فرقعة
copper turning	خراطة نحاس
dilute	مخفف
magnesium ribbon	شريط ماغنسيوم
neutralization	تعادل
limewater	ماء جير
precipitate (ppt.)	راسب
oxidation	أكسدة
reduction	اختزال
oxidizing agent	عامل مؤكسد
reducing agent	عامل مُختزل
percentage	نسبة
take away	يأخذ
concurrent	متلازم

Lesson 2

fireworks	ألعاب نارية
caustic soda	صودا كاوية
rusting of iron	صدأ الحديد
concentration	تركيز
disappearance	اختفاء
appearance	ظهور
nature of the reactants	طبيعة المتفاعلات
covalent compounds	مركبات تساهمية
molecules	جزيئات
ionic compounds	مركبات أيونية
surface area	مساحة السطح
collision	تصادم
concentrated	مركز
bubbles	فقاعات
effervescent tablet	قرص فوار
effervescence	فوران
catalyst	عامل حفاز
enzyme	إنزيم

Unit 2

Lesson 1

electric current	التيار الكهربى
current intensity	شدة التيار الكهربى
potential difference	فرق الجهد
electric resistance	المقاومة الكهربية
electromotive force	القوة الدافعة الكهربية
series connection	التوصيل على التوالى
parallel connection	التوصيل على التوازى

Lesson 2

direct current	تيار مباشر
alternating current	تيار متردد
unidirection	موحد الاتجاه
electroplating	الطلاء الكهربى
ribbon	شريط

Lesson 3

radioactivity	النشاط الإشعاعى
nuclear reactions	تفاعلات نووية
nearly	تقريبًا
achieve	يتم
isotopes	نظائر
radioactive elements	عناصر مشعة
spontaneous conversion	تحويل تلقائى
attempt	محاولة

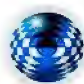
unseen	غير مرئى
penetrate	يخترق
mankind	الجنس البشرى
peaceable	سلمى
cosmic radiation	الأشعة الكونية
nuclear bomb	القنبلة النووية
bone marrow	نخاع العظام
spleen	الطحال
nausea	غثيان
gloves	قفازات
precautions	احتياطات

Unit 3

genetics	علم الوراثة
the main principles of heredity	المبادئ الأساسية للوراثة
research	بحث
transmission	انتقال
hereditary traits	صفات وراثية
generation	جيل
offspring	أبناء
asexual reproduction	تكاثر لاجنسى
sexual reproduction	تكاثر جنسى
similarity	تشابه
difference	اختلاف
mating	تزاوج
acquired traits	صفات مكتسبة
skills	مهارات
monk	راهب
hermaphrodite	خنثى
human intervention	تدخل الإنسان
self pollination	تلقيح ذاتى
mixed pollination	تلقيح خلطى
stigmas	مياسم
pistils	متاع
principle of complete dominance	مبدأ السيادة التامة
inheritance	وراثة
hereditary factors	عوامل وراثية
genes	چينات
gametes	جاميتات
contrasting pairs	أزواج متضادة
dominant	سائد
recessive	مُتنحى
segregate	ينعزل
aggregate	يتجمع
pure dominant	سائد نقى
hybrid	هجين
pure recessive	مُتنحى نقى
assumptions	فروض
disappearance	اختفاء
law of segregation of factors	قانون انعزال العوامل
independent assortment of hereditary factors	التوزيع الحر للعوامل الوراثية
Mendelian heredity	الوراثة المندلية
dimples	غمازات
freckles	نمش
strand	شريط
spiral ladder	سلم حلزونى
double helix	لولب مزدوج
nitrogenous bases	قواعد نيتروجينية
units	وحدات
nucleotides	نيوكليوتيدات
distinct trait	صفة محددة
genotype	التركيب الچينى
nature	طبيعة
recombination	إعادة اتحاد
exposure	تعرض
capability	القدرة
create	تخليق
appropriate time	وقت مناسب
possibility	إمكانية
bio-technology	التكنولوچيا الحيوية
combat	مكافحة
malnutrition	سوء التغذية
deficiency	نقص
human genome project	مشروع الچينوم البشرى
vascular	وعائى
mental diseases	أمراض عقلية

Unit 4

hormones	هرمونات
organize	نظم
coordinate	نسق
researches	أبحاث
endocrine glands	غدد صماء
ductless glands	غدد لا قنوية
target cells	خلايا مستهدفة
secrete	تُفرز
hormone disorder	خلل هرمونى
pituitary gland	غدة نخامية
thyroid gland	غدة درقية
adrenal gland	غدة كظرية
master gland	سيدة الغدد
growth hormone	هرمون النمو
mammary glands	غدد ثديية
vocal cords	أحبال صوتية
food assimilation processes	عمليات التحول الغذائى
transference	نقل
stimulating	تحفيز
prior	قرب
emergencies	حالات الطوارئ
female (or male) secondary sex characters	صفات جنسية ثانوية أنثوية «أو ذكرية»
endometrium	بطانة الرحم
dwarfism	القزامة
gigantism	العملقة
simple goiter	الجوتير البسيط
exophthalmic goiter	الجوتير الجحوظى
diabetes	البول السكرى
genetic engineering technology	تقنية الهندسة الوراثية


EL-MOASSER SERIES

SCIENCE

SECOND TERM

By A Group Of Supervisors

3rd prep. 2019

NOTEBOOK

- Worksheets
- Final revision
- Final examinations

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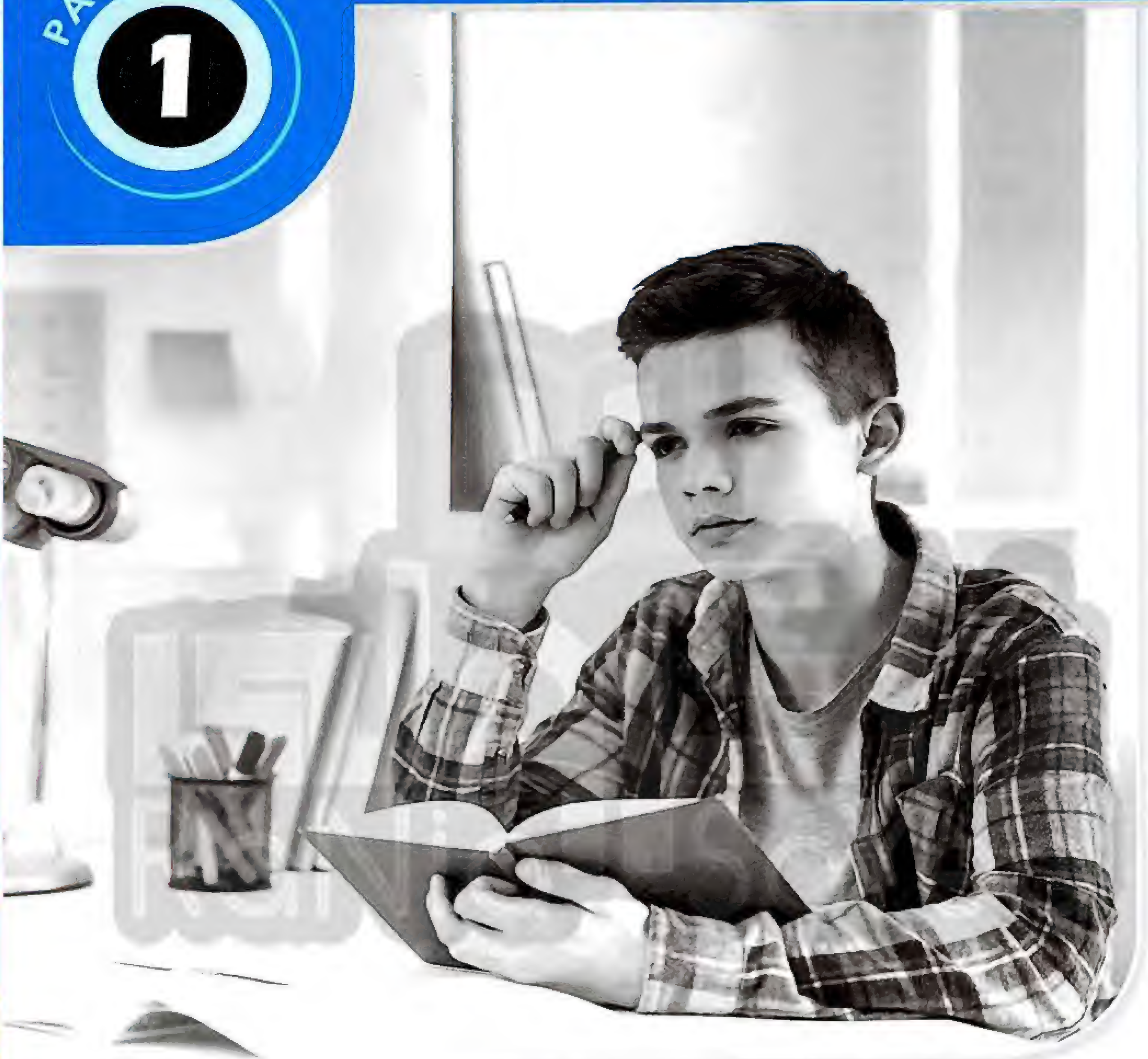
PART 1

Worksheets



Worksheets on :

Unit One : Chemical Reactions.

Unit Two : Electric Energy and Radioactivity.

Unit Three : Genes and Genetics.

Unit Four : Hormones.

UNIT ONE

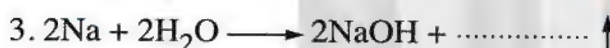
Lesson 1 Chemical Reactions

Worksheet 1

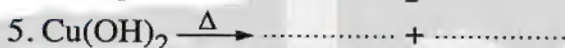
1. A. Choose the correct answer :

1. $2NaNO_3 \xrightarrow{\Delta}$ .... + ...
   a. $NaNO_3$ b. $2NaNO_2 + O_2$
   c. $NO_2 + O_2$ d. all the previous answers.

2. .... $\xrightarrow{\Delta} CuO + CO_2$
   a. $CuCO_3$ b. $CuSO_2$
   c. $CuSO_4$ d. all the previous answers.


3. $2Na + 2H_2O \longrightarrow 2NaOH +$ .... $\uparrow$
   a. N_2 b. Cl_2 c. H_2 d. O_2

4. Some metal nitrates decompose by heating and .... gas evolves.
   a. SO_3 b. SO_2 c. O_2 d. CO_2


5. $Cu(OH)_2 \xrightarrow{\Delta}$ .... + ...
   a. $CuO + H_2O\uparrow$ b. $CuO + H_2$ c. $Cu + H_2O\uparrow$ d. no correct answer.

6. The substitution reactions take place when there is ....
   a. less active element replaces more active element.
   b. less active compound replaces more active compound.
   c. more active element replaces less active element.
   d. more active compound replaces less active compound.

B. Give reasons for :

1. Copper does not react with dilute hydrochloric acid.
   ....
   ....
2. Although Al comes before Zn in chemical activity series, but it takes a longer time to react with the hydrochloric acid practically.
   ....
   ....
3. Sodium replaces hydrogen of acids.
   ....
4. A red ppt. is formed when magnesium is added to copper sulphate solution.
   ....

2. A. Complete the following statements :

1. The breaking up of bonds in the molecules of reactants and formation of new bonds in the molecules of products is called ....

2. The .... colour of copper carbonate disappears on heating and a black colour of .... is formed.
3. Most metal sulphates decompose by heat into .... and ....
4. Some metal nitrates decompose by heat into .... and ....
5. Red mercuric oxide decomposes by heat into .... and .... gas evolves.

B. What is meant by chemical activity series ?

....

....

C. Compare between heating of metal oxide and metal hydroxide :

Heating of metal oxide	Heating of metal hydroxide
....	....
....	....
....	....

3. A. Illustrate by balanced symbolic chemical equations the following reactions :

1. The effect of heat on blue copper hydroxide.

....

2. Adding of dilute hydrochloric acid to a piece of zinc.

....

3. Insertion of a magnesium ribbon into a solution of copper sulphate.

....

B. Write the scientific term :

1. The chemical reactions which involve the breaking up of compounds by the effect of heat. [..............................]
2. The chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds. [..............................]

C. The opposite figure represents the reaction of sodium with water :

1. What is the name of the evolved gas ?

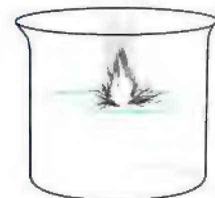
....

2. Write the equation of the reaction.

....

3. What is the type of the reaction ?

....



4. A. What happens when ... ? [Write the chemical equation]

1. Heating of copper hydroxide.

....

....

PART 1

2. Adding of dilute HCl to a piece of aluminium.

....

....

B. Complete the following equations :

1. $CuSO_4 \xrightarrow{\Delta}$ .... + ...

2. $Mg + 2HCl \xrightarrow{dil.}$ .... + ...

3. $2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 +$ ....

C. What is the scientific idea on which the air bags in cars are designed ?

....

....

....

....

Worksheet 2

1. A. Complete the following statements :

1. During the reaction of sodium with chlorine, chlorine atom is reduced as it .... an electron and changes into .... ion.
2. On adding silver nitrate solution to sodium chloride solution, a .... precipitate of .... is formed.
3. When hydrogen gas passes over hot copper oxide, hydrogen is .... as it combines with ....

B. Write the scientific term :

1. The substance which takes oxygen away or gives hydrogen during a chemical reaction. [...]
2. A chemical process where the atom loses an electron or more. [...]

2. A. Choose the correct answer :

1. The oxidizing factor is the substance which ....
   a. gives oxygen only. b. takes hydrogen only.
   c. gains electron(s) only. d. (a) , (b) and (c).
2. Double substitution reactions are classified into ....
   a. reaction between acid and alkali. b. reaction between acid and salt.
   c. reaction between salt and another salt. d. all the previous answers.
3. In the reaction of hydrogen with black copper oxide, ... process takes place to copper oxide.
   a. oxidation b. reduction
   c. oxidation and reduction d. no correct answer

B. Give reasons for :

1. A white precipitate is formed on adding silver nitrate solution to sodium chloride solution.

....

....

2. Oxidation and reduction are concurrent processes that happen at the same time.

....

....

3. A. In the reaction :

$H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$

Determine the oxidizing agent and the reducing agent and mention why ?

....

....

B. What is meant by ... ?

1. Reduction :

....

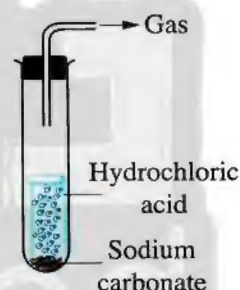
....

2. Neutralization reaction :

....

....

4. A. From the opposite figure, answer the following questions :



1. Mention the name of the evolved gas.
   How can you discover it ?
   ....

2. Write the balanced chemical equation which expresses this reaction.
   ....

B. What happens when ... ? : (write the chemical equation if it is possible)

1. Adding of silver nitrate solution to sodium chloride solution.

....

....

2. Sodium atom ($_{11}Na$) loses an electron during the chemical reaction.

....

....

3. An atom of an element gains one electron or more during the chemical reaction.

....

....

C. Compare between oxidation and oxidizing agent from the point of the meaning of each one :

Oxidation	Oxidizing agent
....	....
....	....
....	....

UNIT ONE

Lesson 2 Speed of Chemical Reactions

Worksheet 3

1. A. Complete the following statements :

1. .... compounds are fast reacting compounds, while .... compounds are slow reacting compounds.
2. At the end of the reaction, the concentration of the .... becomes zero, while the concentration of the .... becomes 100 %.

B. Choose the correct answer :

1. During the chemical reaction, the concentration of the resultants ....
   a. becomes zero. b. becomes100 %
   c. decreases gradually. d. increases gradually.
2. Some reactions need several months to occur such as ....
   a. fireworks. b. rusting of iron.
   c. formation of soap. d. formation of petroleum.

2. A. Mention the factors which affect the speed of chemical reaction :

1. .... 2. ....
3. .... 4. ....

B. Complete the following equation, then mention how can you measure the speed of this reaction practically.

$2NaOH + CuSO_4 \longrightarrow$ .... + ...

....

....

3. A. Give reasons for :

1. Ionic compounds are fast reacting compounds, while covalent compounds are slow reacting compounds.

....

....

2. Iron filings reacts with dil. HCl faster than a block of iron.

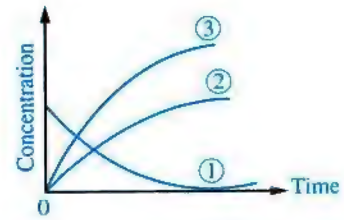
....

B. What is meant by the speed of chemical reaction ?

....

....

4. A. The following equation explains the breaking up of a compound : $X \longrightarrow 2Y + \frac{1}{2} Z$



The opposite graph represents the concentration of the reactants and products with respect to time.

1. Write the name of the compound or the element which each number indicates.

....

2. What happens to the concentration of X and Y during the reaction ?

....

B. Explain an activity to show the effect of surface area on the speed of chemical reaction. [Write the equation of the reaction]

....
....
....
....
....

Worksheet 4

1. A. What happens when and why ?

1. Adding of a piece of sweet potato to a beaker containing hydrogen peroxide.

....
....

2. Increasing the temperature of the reaction.

....
....

B. Complete the following :

1. In the catalytic converter, the ceramic cells covered with a thin layer of .... metal.
2. The effervescent tablet reacts with .... water slower than the .... water.

C. Mention three uses of sodium bicarbonate in home.

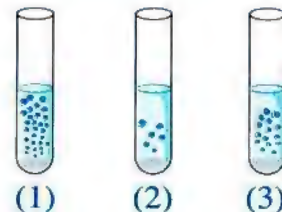
....
....
....

2. A. Mention the common properties of catalyst :

1. ....
2. ....
3. ....
4. ....
5. ....

PART 1

B. In the opposite figure, three similar amounts of zinc are put in three tubes, then added hydrochloric acid with different concentration to them :



1. Arrange the tubes ascendingly according to the concentration of hydrochloric acid.

....

2. In which tube, the reaction will end first ? (Explain your answer).

....

3. A. Give reasons for :

1. To preserve meat for a long time, you should put it in the freezer.

....

....

2. Aluminium wire burns inside a jar filled with pure oxygen faster than in atmospheric air.

....

....

B. In which experiment shown in the following table, the rate of the reaction between zinc and hydrochloric acid is the fastest reaction ? [Explain your answer].

Experiment	Temperature	Form of zinc	Concentration of hydrochloric acid
(1)	30°	sheet	dil.
(2)	30°	powder	dil.
(3)	90°	powder	conc.
(4)	90°	powder	dil.
(5)	90°	sheet	conc.

....

....

4. A. Choose the correct answer :

1. The speed of chemical reaction increases by increasing all of the following except the ....
   - a. surface area of the reactants.
   - b. number of reactants.
   - c. temperature of the reaction.
   - d. concentration of the reactants.
2. .... increases the number of collisions between molecules and consequently increases the speed of reaction.
   - a. Adding a catalyst
   - b. Increasing the reaction temperature
   - c. Increasing the reactants concentration
   - d. Both (b) and (c)

3. .... is used in polishing metals.

a. Sodium carbonate.
b. Sodium hydroxide.
c. Sodium bicarbonate.
d. Sodium azid.

B. In the reaction :

$Mg + 2HCl \xrightarrow{dil.} MgCl_2 + ... \uparrow$

1. Mention the name of the evolved gas : ....

2. Explain the effect of the concentration of the reactants on the speed of the reaction.

....

....

C. What is meant by the catalyst ? Mention the types of catalytic reactions.

....

....

....

General Exercise of the School Book on Unit ONE

1. Complete the following sentences :

1. The breaking up of bonds in the molecules of reactants and formation of new bonds is called ....
2. The speed of chemical reactions .... due to the increase of temperature.
3. Oxidation and reduction are two .... processes.

2. Correct the underlined words :

1. The increase in the concentration of the reactants, increases the number of probable collisions between molecules so that the speed of reaction **decreases**. [...............]
2. Most metal carbonates decompose on being heated into **metal** and carbon dioxide. [...............]
3. The reactions of ionic compounds are **slower** than that of the covalent compounds. [...............]

3. Write the scientific term :

1. Chemical reactions in which the compound is decomposed by heat into simple components. [..]
2. The change in the concentration of reactants and products in the time unit. [..]
3. A substance that increases the speed of the chemical reaction without interfering in it or being consumed. [..]
4. A chemical process in which an atom of the element gains one or more electron. [..]

4. Write the symbolic balanced equations for the following :

1. The reaction of water with sodium.

....

2. The decomposition of sodium nitrate by heat.

....

3. Placing a piece of magnesium ribbon in a solution of copper sulphate.

....

4. The reaction of hydrochloric acid with sodium hydroxide.

....

5. Explain the following :

1. The occurrence of gas bubbles on putting a piece of aluminium in diluted hydrochloric acid.

....

....

2. The rate of the reaction of hydrochloric acid with iron filings is faster than its reaction with a piece of iron with the same mass.

....

....

3. Preservation of food in the freezer of the fridge.

....

....

6. Compare between each of the following :

1. Simple substitution and double substitution reactions.

Simple substitution reactions	Double substitution reactions
....	....
....	....
....	....
....	....

2. Heating of both the metal oxide and metal hydroxide.

Heating of metal oxide	Heating of metal hydroxide
....	....
....	....
....	....
....	....

Model Exams on Unit ONE

Model Exam 1

20

Answer the following questions :

Question 1 — 5 marks

A Write the scientific term :

1. The change in the concentration of the reactants and resultants at a unit time. [..]
2. The breaking up of bonds between reactants molecules, and formation of new bonds between products molecules. [..]
3. The substance which loses an electron or more during the chemical reaction. [..]
4. The substance which speeds up the chemical reaction without changing or being used up. [..]

B Give reasons for :

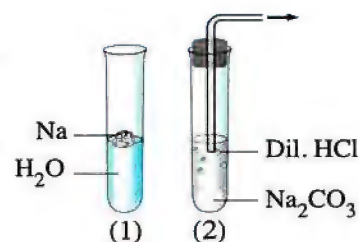
1. We use a catalyst in the chemical reaction.
....
2. Reactions between ionic compounds are fast whereas, reactions between covalent compounds are slow.
....
3. A red precipitate is formed when magnesium is added to blue copper sulphate solution.
....

Question 2 — 5 marks

A Complete the following statements :

1. Most metal sulphates undergo thermal decomposition into .... and ....
2. At the beginning of the reaction, the concentration of reactants is .... %, while the concentration of the resultants is .... %
3. Any decorative metal pieces made of copper or chrome are polished by rubbing it with a piece of cloth wet with .... and immersed in ....

B **From the opposite figure, answer the following :**



1. What is the name of the resulted gas from the reaction (1) ?

....

2. What is the name of the resulted salt from the reaction (2) ?

....

3. Mention the type of the reaction happened in both tubes (1) and (2), showing that by symbolic equations.

....

....

Question 3 — 5 marks

A **What is meant by ... ?**

1. A catalyst.

....

2. Oxidizing agent.

....

3. Positive catalytic reactions.

....

B **Mention the factors affecting the speed of a chemical reaction.**

....

....

Question 4 — 5 marks

A **Choose the correct answer :**

1. When copper hydroxide is heated, we obtain ....
   a. copper carbonate and water. b. copper oxide and water vapour.
   c. copper oxide and hydrogen. d. copper and hydrogen.
2. All of the following are from the properties of the catalyst except ....
   a. it decreases the energy needed for the reaction.
   b. its mass remains constant after the reaction.
   c. it combines with the resultants.
   d. it is used in a small quantity.
3. The substance which can be used as a catalyst is ....
   a. copper carbonate. b. $Cu(OH)_2$.
   c. magnesium hydroxide. d. manganese dioxide.
4. The gas which evolves on adding dilute HCl to iron filings is ....
   a. Cl_2 b. H_2 c. O_2 d. CO_2

PART 1

B **How can you differentiate practically between :**

Sodium chloride and sodium hydroxide solutions.

....

....

C **The students of one of the classes made the experiment shown in the opposite figure to identify the effect of one of the factors on the speed of the reaction :**

1. What is the factor that affects the speed of this reaction ?

....

2. Mention another way to increase the speed of this reaction.

....

Model Exam 2

20

Answer the following questions :

Question 1 — 5 marks

A **Complete the following :**

1. The speed of chemical reaction .... as the concentration of the reactants increases due to the increase in the number of .... between molecules.
2. Oxidase enzyme in sweet potato acts as a .... to increase the rate of decomposition of ....
3. On heating of copper carbonate solution, its colour changes from .... to ....

B **Give reasons for :**

1. Using nickel filings in hydrating oil instead of pieces of nickel.

....

....

2. The occurrence of effervescence on putting a piece of aluminium in diluted hydrochloric acid.

....

....

Question 2 — 5 marks

A Study the following reaction, then put (✓) or (×) in front of each of the following statements :

$2Na + Cl_2 \longrightarrow 2Na^+ + 2Cl^-$

1. Sodium is an oxidizing agent. ( )
2. Chlorine is a reducing agent. ( )
3. The changing of the sodium atom into sodium ion represents oxidation process. ( )
4. The changing of the chlorine atom into chloride ion is a reduction process. ( )

B What is meant by ... ?

1. Thermal decomposition reactions.

....

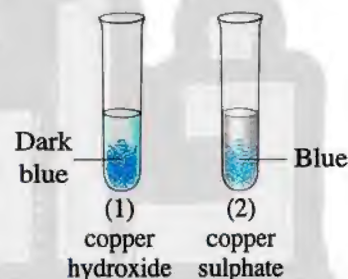
....

2. Speed of chemical reaction.

....

....

C Samy put few of each of the following substances (copper hydroxide and copper sulphate) in dry clean test tubes as shown in the figure, then he heated each tube gently, then strongly. He noticed the formation of a black substance in the two tubes.



1. Explain the formation of the black substance. (Write the equations)

....

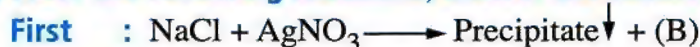
....

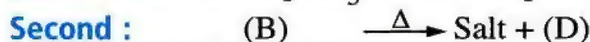
2. What are the types of these reactions ?

....

Question 3 — 5 marks

A From the following reactions, answer the following questions :


First : $NaCl + AgNO_3 \longrightarrow$ Precipitate↓ + (B)


Second : (B) $\xrightarrow{\Delta}$ Salt + (D)

1. Write the symbol of (B) and (D).

....

2. Mention the name and the chemical formula of the precipitate and the salt.

....

3. Mention the kind of each reaction.

....

PART 1

B Write the scientific term :

1. The arrangement of metallic elements in a descending order according to their chemical activity. [..................]
2. The reaction between an acid and a base to form salt and water. [..................]
3. The chemical substances produced by the body of living organism, act as catalysts that increase the biological reactions. [..................]
4. A chemical process which causes the increase of the oxygen content or the decrease of the hydrogen content. [..................]

Question 4 — 5 marks

A Compare between :

1. Simple substitution reactions and double substitution reactions.

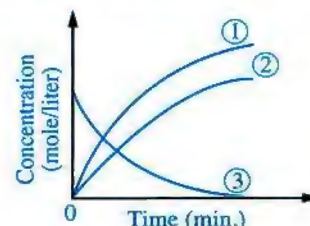
Simple substitution reactions	Double substitution reactions
....	....
....	....
....	....
....	....
....	....

2. Positive catalytic reactions and negative catalytic reactions.

Positive catalytic reactions	Negative catalytic reactions
....	....
....	....
....	....

B The opposite graph represents the rate of rapid decomposition of the substance of sodium azid (which is present inside the air bag) :

$2NaN_3 \xrightarrow{\text{Electric spark}} 2Na + ...$



1. Complete the equation.
2. From the graph, write the name of the compound or the element which is indicated by each number.

....

3. Mention the importance of air bag.

....

UNIT TWO

Lesson 1 The Physical Properties of the Electric Current

Worksheet 5

1. A. Give reasons for :

1. In the electric circuit, the ammeter is connected in series.

....

2. The voltmeter is connected across the two poles of a battery.

....

3. The electric energy is the cleanest source of energy.

....

B. Write the scientific term :

1. The flow of electric negative charges in a conducting material (metal wire). [..]

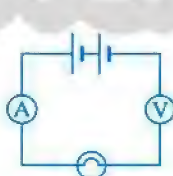
2. Negatively charged particles that rotate around the nucleus. [..]

3. The current intensity produced by flowing one coulomb of electric charges in one second through a conductor. [..]

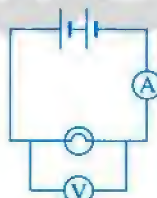
4. The electric state of a conductor that shows the transference of electricity from and to it (when it is connected to another conductor). [..]

2. A. Choose the correct answer :

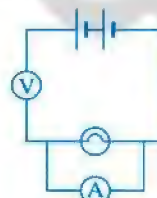
1. Which of the following figures represents the right connection of the ammeter and voltmeter in a circuit ? ....



a.



b.



c.

d.

2. The intensity of electric current passing through a circuit can be measured by using .... apparatus.

a. pyrometer b. barometer c. voltmeter d. ammeter

3. The measuring unit of the electric current intensity is ....

a. ampere. b. volt. c. ohm. d. coulomb.

4. The electromotive force is measured in .... unit.

a. ohm b. ampere c. volt d. joule

PART 1

B. What happens when ... ?

1. Two conductors have the same electric potential are connected by a wire.

....

2. The time of flowing a quantity of electric charges through a certain cross-section of a conductor is doubled.

....

3. Complete the following statements :

1. .... device is used to store the electric energy for a long or short period of time.
2. The number of protons inside the .... of an atom equals the number of .... that rotate around the nucleus, so the atom is electrically neutral.
3. The .... is used to measure the electromotive force of a battery in units known as ....
4. On connecting two charged conductors, the electric current passes from the conductor with .... potential to the conductor which has .... potential.
5. In the electric circuits, ... instrument is symbolized by –(V)– and .... instrument is symbolized by –(A)–
6. The measuring unit of the quantity of electricity is ....

4. Problems :

1. Calculate the potential difference between two points if the work done to transfer a unit charge of 600 coulomb is 16600 joule.

....

....

2. Calculate the quantity of electricity that flows through a wire if the current intensity passing through it is 18 ampere in a time of 7 minutes.

....

....

3. Calculate the electric current intensity when a quantity of electricity of 600 coulomb passes for 3 minutes in a conductor.

....

....

Worksheet 6

1. A. Draw the used electric circuit to achieve Ohm's law, then state Ohm's law and its mathematical relation.

....

....

....

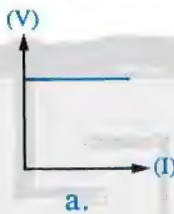
....

B. Rewrite the following statements after correcting the underlined words.

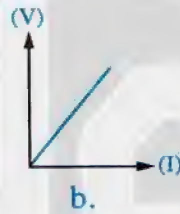
1. The resistance of a conductor that 1 ampere is passed through it when the potential difference between its terminals is 1 volt equals **10 ohm**. [..................................]
2. The **ammeter** is used to measure the electric resistance. [..................................]
3. The electric current intensity passing through a conductor is **inversely** proportional to the potential difference between its ends at constant temperature. [..................................]

2. A. Choose the correct answer :

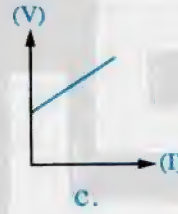
1. The sliding rheostat is used to change .... in the electric circuit.
   a. the current intensity
   b. the potential difference
   c. the resistance
2. The unit that is used in measuring electric resistance is the ....
   a. ohm. b. ampere. c. volt. d. coulomb.
3. The diagram .... verifies Ohm's law.



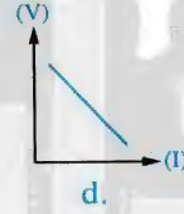
a.



b.



c.



d.

4. The value of the resistance of an electric conductor in an electric circuit is changed on changing ....
   a. dimensions of the conductor.
   b. electric current intensity passing through it.
   c. potential difference between its terminals.
   d. other electric circuit components.
5. The apparatus used to control the value of electric resistance in the circuit is the ....
   a. ammeter. b. voltmeter. c. ohmmeter. d. rheostat.

B. Define :

1. The ohm : ....
   ....
2. The electric resistance : ....
   ....
3. The volt : ....
   ....

PART 1

3. A. Choose from columns (B) and (C) what suit in column (A) :

(A) Physical quantity	(B) Measuring unit	(C) Apparatus used
1. Electric current intensity 2. Potential difference 3. Resistance	a. Ohm b. Coulomb c. Volt d. Ampere e. Joule	A. Voltmeter B. Ammeter C. Wattmeter D. Ohmmeter

1. (.............) 2. (.............) 3. (.............)

B. Problems :

1. Calculate the potential difference between the two ends of a vacuum cleaner whose resistance is 22 ohm and the current intensity passing through it is 10 ampere.

....

....

2. What is the quantity of electricity which passes through a conductor, its resistance is 1000 ohm for 30 minutes when the potential difference across its ends is 220 volt.

....

....

3. Calculate the potential difference between the terminals of an electric set, its resistance is 30 ohm and the intensity of the passing electric current is 10 ampere.

....

....

4. A. What happens when ... ?

1. The length of the rheostat wire which enters the circuit increases (to the electric current).

....

2. The circuit of Ohm's law doesn't contain variable resistance.

....

3. The potential difference between the terminals of a conductor is doubled at constant temperature (for the current intensity passing through it).

....

B. Look at the following symbols, then answer the following questions :

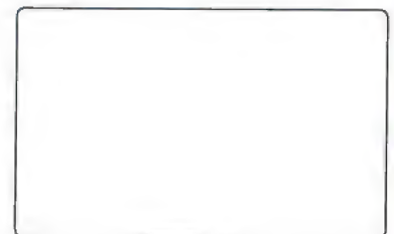
(1) (2) (3) (4) (5) (6)

1. What do the following symbols stand for ?

....

....

2. Make a closed electric circuit using the items above to verify Ohm's law.



UNIT TWO

Lesson 2 Electric Current and Cells

Worksheet 7

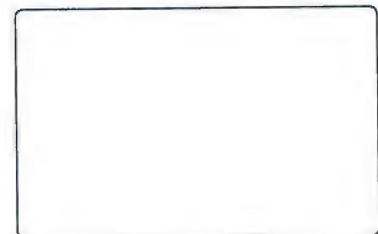
1. A. Complete the following statements :

1. Electric cell produces .... current, while the dynamo produces .... current.
2. The electric current generated from a dynamo is due to converting .... energy to .... energy.
3. Similar electric cells are connected in .... to obtain a high electromotive force and are connected in .... to obtain an e.m.f. equals one of them.
4. In series connection, the negative pole of the first cell is connected to the .... pole of the .... cell.
5. The e.m.f. of a battery that consists of (n) cells connected in parallel and each of them of e.m.f. (E_1) equals ....
6. The .... electric current can be transferred only for short distances.

2. A. Compare between the direct current and the alternating current (two points only) :

The direct current	The alternating current
1.	1. ....
2.	2. ....

B. Look at the following items, then answer the questions :



1. Make a closed electric circuit.
2. How can the current intensity in a circuit be controlled ?
   ....
3. What is the type of connection of the cells ?
   ....
4. If the e.m.f. of each cell is 2 volt. Find the value of total e.m.f.
   ....

PART 1

3. A. Give reasons for :

1. It is better to use the alternating current rather than the direct current.

....

....

2. The electromotive force of a battery whose cells are connected in series is greater than that one whose cells are connected in parallel.

....

....

B. Put (✓) or (×) in front of each of the following statements and correct the wrong ones :

1. In dry cell, magnetic energy is changed into electric energy. ( )

....

2. Electric current in houses is always alternating current. ( )

....

3. The e.m.f. of several cells which are connected in series is equal to the e.m.f. of one cell. ( )

....

4. Problems :

1. You have three similar cells, the electromotive force of each is 1.5 volt. Explain by using a diagram, how can you connect them to obtain an e.m.f. of .... :

a. 1.5 volts. b. 3 volts. c. 4.5 volts.

2. Calculate the e.m.f. for a battery consists of 3 cells, the e.m.f. for each is 1.5 volt, when they are connected : ....

a. In series : .... b. In parallel : ....

3. You have 4 similar cells, the electromotive force of each one is 1.5 volt. Illustrate by drawing how can you connect them to get batteries of e.m.f. of ....

a. 6 volt. b. 4.5 volt.

c. 3 volt (in two ways). d. 1.5 volt.

Worksheet 8 on Lessons 1 & 2

1. A. Complete the following statements :

1. In the electric circuit, the ammeter is connected in ....
2. It is better to use the .... rather than the direct current.
3. The .... is the cleanest source of energy.
4. The voltmeter is connected across the .... of a battary.

B. Put (✓) or (×) in front of each of the following statements and correct the wrong ones :

1. Similar electric cells are connected in series to obtain a low electromotive force. ( )

....

2. The apparatus used to control the value of electric resistance in the circuit is the ohmmeter. ( )

....

2. A. Write the scientific term :

1. The measuring unit of the electromotive force. [..............................]
2. The measuring tool that used to change the value of the electric resistance in the electric circuit. [..............................]

B. Write the mathematical relation of each of the following :

1. Measuring of the electric current intensity.

....

2. Measuring of the potential difference across two terminals of a conductor.

....

3. Ohm's law.

....

3. A. Choose the correct answer :

1. .... is the charge transferred by a constant current of intensity one ampere in one second.

a. Ampere b. Volt c. Ohm d. Coulomb

2. All of the following are equivalent units of coulomb except ....

a. joule/ampere.ohm. b. joule/volt.second.

c. joule/volt. d. volt.second/ohm.

PART 1

3. The quantity of charge can be calculated from the relation ....
   a. current intensity + time in seconds.
   b. current intensity ÷ time in seconds.
   c. current intensity × time in seconds.
   d. current intensity – time in seconds.

4. If two conductors are connect by a copper wire, conductor (A) of 6600 coulomb and conductor (B) of 3300 coulomb, then the electric charges ....
   a. pass from conductor (B) to conductor (A).
   b. pass from conductor (A) to conductor (B).
   c. not pass in any direction.
   d. pass in both directions.

B. Correct the underline words :

1. The **nuclear** energy is the cleanest source of energy. [..............]
2. Their is **no relation** between the electric current intensity passing through a conductor and the potential difference between its ends at constant temperature. [..............]

4. A. Verify Ohm's law :

....
....
....
....

B. What happens when ... ?

1. The quantity of charge flows through a conductor increases to the double, and the time remains constant.

....

2. The work done through a conductor increases to the double, and the quantity of charge decreases to the half.

....

C. Problem :

Calculate the amount of work needed to pass an electric charge 500 coulomb across a conductor with a resistance 3 ohm and the electric current intensity passes through it 2 amp.

....
....
....
....

UNIT TWO

Lesson 3 Radioactivity and Nuclear Energy

Worksheet 9

1. A. What is meant by ... ?

1. Rem : ....

2. Natural radioactivity : ....

....

B. Put (✓) or (×) :

1. Water produced from nuclear stations must be heated before throwing it in the seas. ( )

2. The Chernobyl accident resulted in the pollution of food products by stable elements. ( )

3. We can generate electricity by using nuclear energy. ( )

2. A. Compare between genetic effects and cellular effects produced from radiation :

Genetic effects	Cellular effects
....	....

B. Choose the correct answer :

1. .... is a non-radioactive element.

a. Radium b. Uranium c. Zerconium d. Iron

2. Human beings should not be exposed to radiation in amounts more than .... rem.

a. 5 b. 3 c. 8 d. 10

3. The radioactivity phenomenon was discovered by the scientist ....

a. Ohm. b. Becquerel. c. Ampere. d. Volt.

4. Cosmic radiation is from .... sources of radiation pollution.

a. natural b. artificial c. industrial d. no correct answer

PART 1

3. **Give reasons for :**

1. Radioactivity has natural sources and also artificial.

....

2. The areas chosen for storing radioactive wastes should be steady.

....

3. The nuclei of radioactive elements are unstable.

....

4. After the Chernobyl accident, radioactive isotopes were found in the food products.

....

5. Binding the atom's nucleus although it has repulsion force.

....

....

4. **Complete the following statements :**

1. The composition of the atom is responsible for the .... and .... properties of the element.
2. Nuclear energy is used in medicine in .... and .... of some diseases.
3. Radiation pollution is the increase of the amount of .... in the ....
4. Isotopes are atoms of the same number of .... and with different number of ....
5. The nuclear wastes of weak and medium radiation are surrounded by a .... layer or .... and are placed deep inside the ground.

5. **A. Mention three ways of protection from radioactive pollution.**

....

....

B. "Nuclear energy is used in peaceful purposes" Mention the most important uses in each of the following fields.

1. Medicine : ....
2. Agriculture : ....
3. Industry : ....
4. Generating electricity : ....

General Exercise of the School Book on Unit TWO

1. Write the scientific term that responds to each of the following statements :

1. The flow of electric charges in a conductor. [..................................]
2. The electric current of constant intensity and direction. [..................................]
3. The resistance of a conductor that allows the passing of an electric current of 1 ampere through it when the potential difference between its two ends is 1 volt. [..................................]
4. The intensity of the electric current flowing in an electric circuit when an electric charge of 1 coulomb passes within the conductor's cross section in 1 second. [..................................]
5. The device used to measure the intensity of the electric current passing in a conductor. [..................................]
6. The electric state of a conductor that shows the transference of electricity from and to it. [..................................]
7. The measurement unit of the electromotive force of the electric cell. [..................................]
8. The measuring unit of the absorbed radiation. [..................................]
9. The natural decaying of the atoms of some elements in nature as an attempt to reach a more stable composition. [..................................]

2. Choose the correct word :

1. Direct current can be produced form ....
   a. electrochemical cells. b. electric generators. c. electric power stations.
2. The .... is the measuring unit of the electric charges.
   a. coulomb b. ampere c. volt
3. The .... is the measuring unit of the electromotive force.
   a. coulomb b. ampere c. volt
4. The .... is used to measure the electric resistance.
   a. ammeter b. voltammeter c. ohmmeter

5. The .... is the measuring unit of the current intensity.
a. coulomb b. ampere c. ohm

6. The mathematical relation of Ohm's law is ....
a. R = V/I b. I = RV c. R = V × I

7. You should not be exposed to radiation more than .... rem daily.
a. 5 b. 15 c. 25

3. Give reasons for :

1. It is better to use the alternating current rather than the direct current.
....
....

2. The voltameter is connected to both poles of the battery in the electric circuit.
....
....

3. Rheostat is used in some electric circuits.
....
....

4. Some cells are connected in the electric circuit in series.
....
....

5. Some cells are connected in the electric circuit in parallel.
....
....

6. The electromotive force of a battery whose cells are connected in series is greater than that one whose cells are connected in parallel.
....
....

7. Some elements are called "the radioactive elements".
....
....

8. Radiation has genetic effects.
....
....

4. Calculate the potential difference between the two ends of a vacuum cleaner whose resistance is 22 ohm and the current intensity passing through it is 10 ampere.

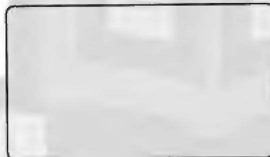
....

5. You have 4 similar electric cells. The potential difference of each one is 1.5 volt. Illustrate by drawing how you connect them to get batteries of e.m.f of :

① 6 volt.

② 4.5 volt.

③ 3 volt (in two ways).



④ 1.5 volt.

Model Exams on Unit TWO

Model Exam 1

20

Answer the following questions :

Question 1 — 5 marks

Complete the following statements :

1. The electric current intensity is measured by using .... and its measuring unit is ....
2. The opposition that the electric current faces during the passage through a conductor is ....
3. .... scientist discovered the emission of an unseen ray from the .... element that has the ability to penetrate solid objects.
4. Dry cell produces .... current, while the dynamo produces .... current.
5. .... instrument is used to measure the electromotive force and .... , while .... is used to control the current intensity in the circuit.

Question 2 — 5 marks

A Give reasons for :

1. The nuclei of radioactive elements are unstable.

....

2. When two conductors have the same potential are connected, no electric current passes.

....

3. Some cells are connected in the electric circuit in parallel.

....

B Choose the correct answer :

1. To generate a direct electric current, we use the ....
   a. dry cell. b. dynamo. c. ammeter. d. ohmmeter.
2. The measuring unit of the absorbed radiation is the ....
   a. curie. b. rem. c. rontgen. d. ohm.
3. The ammeter is used to measure .... in the electric circuit.
   a. the potential difference b. the current intensity
   c. the resistance d. the e.m.f.

4. One volt equals ....

a. ampere × ohm. b. $\frac{\text{joule}}{\text{coulomb}}$ c. $\frac{\text{coulomb}}{\text{sec}}$ d. (a) and (b).

Question 3 — 5 marks

A Write the scientific term :

1. The electric current of fixed intensity and direction. [..................................]
2. The work done to transfer a unit of electric charge between two ends of this conductor. [..................................]
3. The changes that take place to the living organism due to its exposure to radiation. [..................................]
4. Positively charged particles found in the nucleus of an atom. [..................................]
5. The device which can be used to convert the mechanical energy into electric energy. [..................................]
6. The flow of electric negative charges through a conductor. [..................................]

B What happens ... ?

1. To the ammeter and voltmeter readings used in verifying Ohm's law if the resistance is burnt.

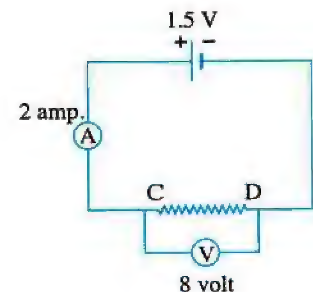
....

2. When the length of the rheostat wire increases (to the electric current intensity).

....

Question 4 — 5 marks

A Look at the opposite figure, then answer :



1. What's the type and the value of the resistance CD ?

....

2. Does this circuit help to verify Ohm's law practically ?
And why ?

....

PART 1

B **Put (✓) or (×) :**

1. The direct current can be transferred for long distances. ( )
2. Killing cancer cells is from the uses of nuclear energy in the medical field. ( )
3. The e.m.f. is the ratio between the potential difference across the conductor to the current intensity flowing through it. ( )

C **Calculate the quantity of electricity passing through a conductor, its resistance is 2200 ohm for two minutes when connected with an electric source its electric potential is 220 volt.**

....

....

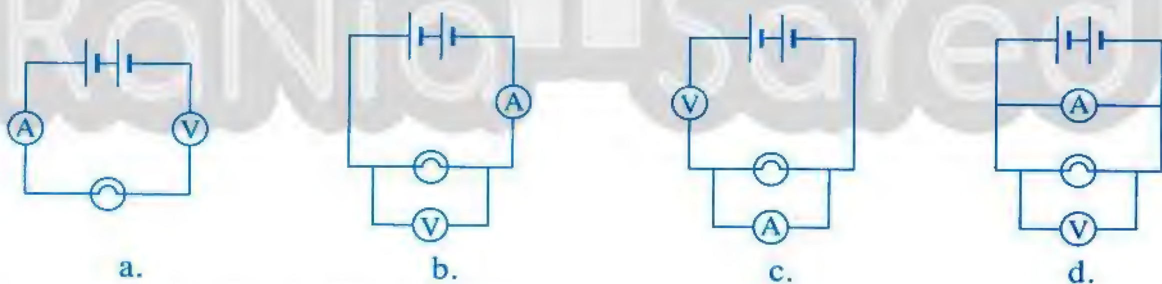
Model Exam 2

20

Question 1 5 marks

A **Choose the correct answer :**

1. Which of the following figures represents the right connection of the ammeter and voltmeter in the circuit ?..........



a. b. c. d.

2. .... is a non-radioactive element.
   a. Radium b. Uranium c. Zerconium d. Iron
3. The alternating current is produced from ....
   a. dry cell. b. voltmeter. c. ammeter. d. dynamo.
4. .... is the measuring unit of the electric charges.
   a. Coulomb b. Ampere
   c. Volt d. no correct answer

B Give reasons for :

1. The rheostat controls the current intensity flowing through the electric circuit.

....

2. The areas chosen for storing radioactive wastes should be steady.

....

3. The electromotive force of a battery whose cells are connected in series is greater than that one whose cells are connected in parallel.

....

Question 2 — 5 marks

Complete the following :

1. There are several physical properties of the electric current as the ...., potential difference and resistance. [.......................................]
2. The types of radioactivity are .... radioactivity and .... radioactivity. [.......................................]
3. The electric current produced from the .... is an alternating current, while the electric current produced from the .... is a direct current. [.......................................]
4. The changes in the cells composition are .... effects, while .... effects are the changes in the sex chromosomes composition due to exposure to radiation. [.......................................]
5. The measuring unit of the work is .... , while that of potential difference is ....
6. When no current passes in a circuit, the reading of the voltmeter connected by a battery indicates the .... [.......................................]

Question 3 — 5 marks

A Write the scientific term for each of the following :

1. The natural spontaneous decaying of the atoms of some elements in nature as an attempt to reach a more stable composition. [.......................................]
2. Atoms of the same element with different number of neutrons and with the same number of protons. [.......................................]
3. A type of connection of electric cells used to obtain high e.m.f. [.......................................]
4. The electric state of a conductor that shows the transference of electricity from and to it. [.......................................]
5. The changes that take place to the living organism due to its exposure to radiations. [.......................................]

PART 1

B Calculate the potential difference across the two ends of a vacuum cleaner whose resistance is 22 ohm and the current intensity passing through it is 10 ampere.

....

....

C Compare between : Voltmeter and ammeter.

....

....

....

....

Question 4 *5 marks*

A Correct the underlined words :

1. The maximum safe doses of nuclear radiation should not exceed **3 curie in a week**. [..............................]
2. **The alternating current** is unidirectional and has constant intensity. [..............................]
3. The e.m.f. of a group of similar cells which are connected **in series** is equal to the e.m.f. of one cell. [..............................]
4. Joule = **Ampere** × Volt. [..............................]

B Define each of the following :

1. Ohm's law.

....

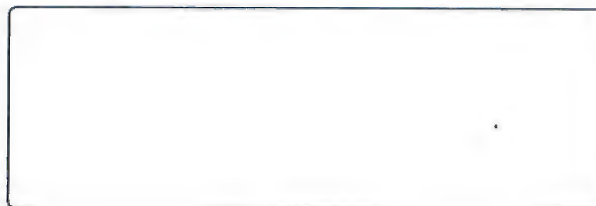
....

2. Artificial radioactivity.

....

....

C Draw the electric circuit used to conclude the relation between electric current intensity and potential difference between its two ends.



UNIT THREE

The Lesson The Main Principles of Heredity

Worksheet 10

1. Complete the following statements :

1. .... traits are not transmitted from one generation to another.
2. The scientist .... is the founder of heredity, he used the seeds of .... plant, because its flowers are .... and thus it can self-pollinate.
3. Mendel's first law is called the law of ....
4. Mendel assumed that the hereditary traits depends on the .... which carry the inherited traits and are transmitted by ....
5. The skill of writing is an example of .... traits, while the hair colour is an example of .... traits.
6. .... is a science that researches the transmission of the hereditary traits from one generation to another.

2. A. Mendel placed a group of hypotheses to explain the appearance of the dominant trait and the disappearance of the recessive trait in the first generation in the experiments that he carried with the pea plant. Explain these hypotheses (briefly).

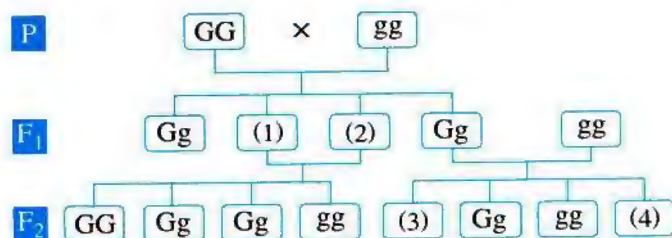
....

....

....

....

B. The opposite figure shows the inheritance of the colour of pods trait in pea plant.



1. What are the phenotypes of the parents ?

....

2. Replace the numbers with the suitable symbols.

....

3. What is the type of pollination between :

a. Parents : ....

b. (1) & (2) : ....

PART 1

3. A. Compare between the dominant trait and the recessive trait [2 points only] :

The dominant trait	The recessive trait
....	....
....	....
....	....

B. Give reasons for :

1. Mendel covered the stigmas of the pistils of pea flowers during studying the trait of seed's colour.

....

2. Mendel selected pea plant to conduct his experiments.

....

....

....

4. A. What is meant by ... ?

1. Mendel's first law :

....

....

2. The principle of complete dominance :

....

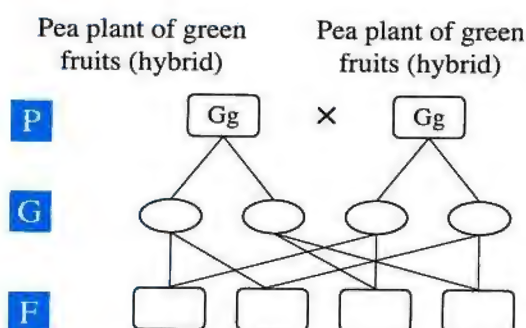
....

3. Hybrid individual :

....

....

B. Complete the following diagram :



5. **Mention seven main traits of pea plant which Mendel used them to conduct his experiments (which is dominant and which is recessive).**

....

....

....

....

....

Worksheet 11

1. **A. Choose the correct answer :**

1. Which of the following traits is dominant in human being ? ....
   a. Smooth hair.
   b. Narrow eyes.
   c. Attached ear lobe.
   d. Absence of freckles.
2. According to Mendel's second law, the recessive trait is inherited independently and appears in the second generation by a ratio of ....
   a. 25 %
   b. 50 %
   c. 75 %
   d. 100 %
3. The result of pollination between two plants, one with hybrid yellow seeds and the other with pure green seeds is ....
   a. 100 % green seeds.
   b. 100 % yellow seeds.
   c. 50 % green seeds and 50 % yellow seeds.
   d. no correct answer.
4. Which one of these traits is recessive in humans ? ....
   a. Curly hair.
   b. Wide eyes.
   c. Free ear lobe.
   d. Smooth hair.
5. The two scientists .... discovered the role of genes in the appearance of hereditary traits.
   a. Badel and Tatum
   b. Watson and Crick
   c. Watson and Tatum
   d. Crick and Badel
6. Genes are transmitted from one generation to another by ....
   a. blood.
   b. ova.
   c. sperms.
   d. gametes.

PART 1

B. Complete the following :

1. Pro-vitamin (A) is called .... substance.
2. The genome project discovered that DNA is similar in humans by a ratio more than .... %.
3. .... is a detailed map included all the human chromosomes.

2. A. Give reasons for :

1. The free ear lobe is dominant over the attached ear lobe.

....

2. On pollination of a red flower pea plant with a white flower pea plant, all offspring are red flower.

....

3. The ability of rolling the tongue is a dominant trait in human being.

....

B. Explain the findings of the two scientists Watson and Crick of the structure of DNA molecule model :

....
....
....

3. A. Problems :

1. If crossing takes place between two pea plants, one of them with smooth yellow seeds (RRYY) and the other with wrinkled green seeds (rryy). Explain on genetic principles the genetic structure for the first and the second generations.

....
....
....

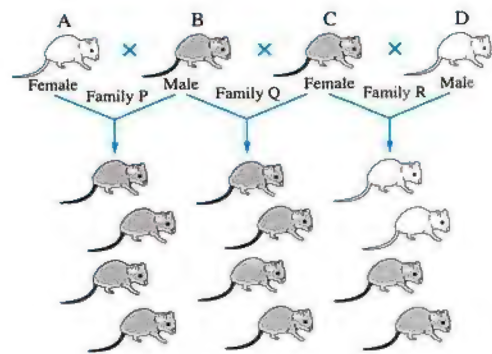
2. Use the following symbols to express the results of mating between yellow hybrid seeds pea plant (Yy) and yellow hybrid seeds pea plant (Yy).

....
....
....

B. What is the importance of pro-vitamin (A) ?

....
....

C. The opposite figure shows the process of inheritance the colour of gray and white fur in mice. If you know that the gene of the gray colour of the fur is symbolized by (G) and the gene of the white colour is symbolized by (g). Conclude the genetic structure of each of the following :



1. Mice (A, B, C, D) :

....

....

2. Family mice (P, Q, R) :

....

....

....

4. A. Explain an experiment to prove the law of independent assortment of the hereditary factors.

....

....

....

....

....

....

B. What is the scientific idea for ... ?

The dominance of the presence of facial dimples trait on the absence of facial dimples trait.

....

C. Write short note about the aims of the human genome project.

....

....

....

....

....

PART 1

5. A. Put (✓) in front of the correct statements and correct the false ones :

1. Mendel's first law is called the law of independent assortment of hereditary factors. (   )

....

2. When two individuals differ in two pairs or more of contrasting characters are crossed, each pair of characters is inherited together and appears in the second generation at a ratio of 3 : 1 (   )

....

3. The fused ear lobe is a dominant hereditary trait. (   )

....

B. Explain how do the genes perform their functions.

....

....

....

....

C. Write the scientific term :

1. Parts of the DNA that are present on the chromosomes and carry the hereditary traits of the individual. [..................................]
2. It is chemically consisted of a nucleic acid called DNA connected with protein. [..................................]
3. A model for DNA molecule which is composed of two strands coiled around each other forming a double helix shape. [..................................]
4. Through which the hereditary traits are transmitted from parents to offspring. [..................................]

General Exercise of the School Book on Unit THREE

1. Place the mark (✓) or (×) in front of the following sentence and correct the mistake :

The acquired traits are transmitted from one generation to another.

( ) ....

2. Mention the scientific term :

1. The appearance of a dominant hereditary trait in the individuals of the first generation after the mating between two individuals, where one carries a pure hereditary trait that contrast the trait that other individual carries. [..]
2. The traits that are not transmitted from one generation to another. [..]
3. Parts of the DNA that are present on the chromosomes and carry the hereditary traits of the individual. [..]

3. Mendel placed a group of assumptions to explain the appearance of the dominant trait and the disappearance of the recessive trait in the first generation in the experiments that he carried with the pea plant. Explain these assumptions.

....

....

....

....

....

4. Explain :

1. An experiment to show the law of independent assortment of the hereditary factors.

....

....

....

....

....

2. How the genes perform their functions.

....

....

....

PART 1

5. Compare between the dominant trait and the recessive one with giving examples :

Dominant trait	Recessive trait
....	....
....	....
....	....

6. Explain :

1. Mendel chose the pea plant in conducting his experiments.

....

....

....

....

2. When you pollinate a pure tall stem pea plant with a short stem pea plant, it produces plants all are tall stems.

....

....

....

3. The free ear lobe is dominant over the attached ear lobe.

....

....

7. By using symbols, express the results of mating between each of the following :

1. White flowers pea plant and red flowers pea plant.

....

....

....

2. Tall stem with green pod pea plant and short stem with yellow pod pea plant.
Showing : Parents, gametes, first generation and second generation in each mating.

....

....

....

....

....

Model Exam on Unit THREE

Model Exam 20

Answer the following questions :

Question 1 — 5 marks

A Complete the following statements :

1. The chromosome is chemically consisted of nucleic acid called .... combined with protein.
2. The trait that appears in all individuals of the first generation in Mendel's experiments is called ....
3. The tall stem in pea plant is .... trait, while the short stem is .... trait.
4. The skill of playing football is an example of .... trait, while the skin colour is an example of .... trait.
5. Every gene gives a special .... which is responsible for the occurrence of a chemical reaction resulting in .... showing a specific hereditary trait.

B Compare between pure individual and hybrid individual :

Pure individual	Hybrid individual
....	....
....	....
....	....

Question 2 — 5 marks

A What would happen when ... ?

1. Mating between two individuals, each of them has a pure trait of the ability to roll the tongue.

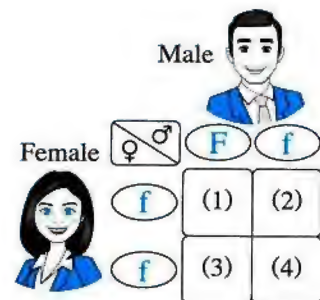
....

2. The gene cannot produce its specific enzyme.

....

PART 1

B **The opposite figure shows the inheritance of facial freckles trait, if you know that the gene of absence of freckles trait is symbolized by (F) and the gene of presence of freckles trait is symbolized by (f). Answer the following questions :**



1. Which of the two traits is dominant and which one is recessive ?
....
2. Mention the genetic structure of individuals from (1) : (4).
....
....
3. Mention the number which represents the genetic structure of.
   a. Hybrid individual : ....
   b. Pure individual : ....
   c. An individual carries the recessive trait : ....
4. Why the freckles do not appear on the face of father, although he carries one of his genes ?
....
5. Show by symbols the result of mating between the individual (1) with another individual has the same genetic structure.
....
....
....
....
6. If the individual (4) has light hair and is mated with a pure woman without freckles in the face and has black hair. Explain on genetic bases, the individuals of the produced generation.
....
....
....
....

Question 3 *5 marks*

A **Give reasons for :**

1. Some people who depend mainly on eating rice have deficiency in vitamin (A).
....
....

2. Mendel removed the stamens from the flowers of the plants before the anther becomes mature.

....

B Write the scientific term :

1. Parts of DNA that are present on the chromosomes and carry the hereditary traits of the individual. [..]
2. A science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring. [..]
3. The cells that transmit the hereditary traits from parents to the offspring. [..]
4. A detailed map includes all the human chromosomes. [..]

Question 4 — 5 marks

A Mention the two laws of Mendel :

- Mendel's first law :

....

....

- Mendel's second law :

....

....

B What is (are) the importance of ... ?

1. Genetically modified rice.

....

2. The human genome project.

....

....

....

....

....

3. Genes :

....

C Put (✓) or (×) :

1. Mendel chose eight contrasting traits in pea plant to conduct his experiments. (   )
2. The ratio of gametes TR in a pea plant whose genetic structure TtRr is 25% (   )

UNIT FOUR

The Lesson Hormones in the Human Body

Worksheet 12

1. Complete the following statements :

1. Increasing of growth hormone secretion in the childlhood stage causes ....
2. When the amount of iodine decreases in the food, the secretion of the .... hormone decreases from .... gland.
3. Deficiency of insulin hormone secretion causes ....
4. The .... hormone responsible for the appearance of the female secondary sex characters, while .... hormone responsible for the appearance of the male secondary sex characters.
5. Hormones are directly secreted into the blood stream by ....
6. When the amount of glucose sugar decreases in blood, pancreas secretes .... hormone.
7. Thyroxin is a .... that regulates food assimilation in your body, while .... hormone controls the level of calcium in blood.

2. A. What is meant by ... ?

1. Hormone : ....
2. Diabetes : ....
3. Endocrine glands : ....

B. Choose the correct answer :

1. Enlargement of thyroid gland accompanied by loss of weight, tension and exophthalmoses are symptoms of .... disease.
   a. exophthalmic goiter b. diabetes
   c. simple goiter d. dwarfism
2. The hormone that stimulates the storage of glucose sugar in liver is the .... hormone.
   a. thyroxin b. insulin c. glucagon d. estrogen
3. Calcitonin hormone is secreted from ....
   a. pancreas. b. thyroid gland.
   c. pituitary gland. d. parathyroid gland.
4. The hormone which stimulates body's organs to respond for emergencies is ....
   a. insulin. b. glucagon. c. estrogen. d. adrenalin.

3. **A. Mention the gland which secretes each of the following hormones :**

1. Progesterone hormone : ....
2. Growth hormone : ....
3. Activating hormone of sexual glands : ....

B. Give reasons for :

1. Pancreas is a mixed gland.
....
....
2. The two adrenal glands have an important role when man is exposed to emergency.
....
....
3. Pituitary gland is called the master gland.
....

4. **A. Correct the underlined words :**

1. Glucose stored in liver in the form of **starch**.
2. **Sweat gland** is one of the endocrine glands as it secrets hormone.
3. **Insulin** is a hormone that regulates food assimilation in the body.
4. **Enzymes** are directly secreted into the blood stream by endocrine glands.
5. **The adrenal** gland is a double function gland.

B. Look at the opposite fig. , then answer :

What is the symbol of the organ that secretes the hormone which stimulates the release of glucose sugar from liver ? And what is the name of this hormone ?

....
....

General Exercise of the School Book on Unit FOUR

1. Complete the following statements :

1. Hormones are directly secreted into the blood stream by ....
2. A chemical substance that controls and regulates the functions of the most of body organs is known as ....
3. Thyroxin is a .... that regulates food assimilation in your body.
4. When the secretion of the growth hormone decreases at the childhood, man suffers from the ....
5. When the amount of glucose decreases in the blood, pancreas secretes .... hormone.
6. When the amount of iodine decreases in the food, the secretion of the .... hormone decreases from .... gland.
7. The .... hormone is secreted when the rate of glucose sugar increases in the blood.

2. Write the scientific term that corresponds to each of the following statements :

1. A chemical message that controls and regulates the activities and functions of the most of body organs. [..........................]
2. Organs secreting hormones in the human body. [..........................]
3. The result when one of the endocrine glands does not act properly. [..........................]
4. A gland secrets a hormone that regulates the growth of the human sexual organs. [..........................]

3. Put a (✓) or (×) in front of the following statements and correct the false ones :

1. Thyroid gland secrets a hormone that organizes the growth and development of sexual organs in the human body. (   )
2. The calcitonin hormone controls the level of calcium in the human body. (   )
3. The glucagon hormone is secreted by pituitary gland. (   )
4. The iron element shares in composing thyroxin hormone. (   )

4. Give reasons for :

1. The height of some persons may reach 2 metres.

....

2. The two adrenal glands have an important role when man is exposed to emergency.

....

3. Pancreas is a double function gland.

....

4. Thyroid gland plays an important role in controlling the level of calcium in the blood.

....

5. Pituitary gland is called the "master gland".

....

6. The height of some persons may reach less than half meter.

....

5. Choose the right answer in each of the following statements :

1. The .... hormone librates the needed energy from the food stuff.

a. growth b. esterogen c. thyroxin

2. The hormone responsible for the appearance of the secondary sexual male characteristics is the .... hormone.

a. progesterone b. testosterone c. adrenalin

Model Exam on Unit FOUR

Model Exam 20

Answer the following questions :

Question 1 — 5 marks

A Complete the following statements :

1. .... hormone is responsible for showing the female secondary sex characters.
2. When the secretion of growth hormone decreases at the childhood, man suffers from .... while when it increases, man suffers from ....
3. .... is a hormone that regulates food assimilation in the human body, while calcitonin hormone controls the level of .... in blood.
4. .... gland secretes a hormone that organizes the growth and development of sexual organs in the human body.
5. Pituitary gland is called the ....

B Compare between :

1. Insulin hormone and glucagon hormone.

....

....

....

....

2. Testis and ovary.

....

....

....

....

Question 2 — 5 marks

A What would happen when ... ?

1. The pancreas decreases its secretion of the insulin hormone.

....

....

2. The glucose level decreases in the blood.

....

....

3. The man diseased with exophthalmic goiter.

....

....

B Define :

1. The master gland.

....

....

2. The double function gland.

....

....

Question 3 5 marks

A Give reasons for :

1. Hormones secreted directly into the blood stream.

....

....

2. Pituitary gland is very important for the height of the human body.

....

....

3. Pancreas is a mixed gland.

....

....

4. Iodine element is very important in food.

....

....

B Correct the underlined words :

1. **Thyroid** gland secretes a hormone regulates the growth of human sex organs. [..........................]

2. **Insulin** hormone is responsible for the appearance of the secondary sex characters of human male. [..........................]

PART 1

Question 4 5 marks

A Write the scientific term :

1. A chemical substance regulates the activities and functions of the body organs. [........................]
2. Organs secrete hormones in the human body. [........................]
3. The hormone that promotes the growth of endometrium. [........................]
4. The hormone that stimulates body's organs to respond to emergencies. [........................]
5. The hormone that regulates the growth of the body as a whole. [........................]

B Choose the correct answer :

1. The hormone that controls calcium level in the blood is ....
   a. adrenalin. b. insulin. c. thyroxin. d. calcitonin.
2. .... element enters in the composition of thyroxin hormone.
   a. Iron b. Iodine c. Calcium d. Sodium
3. .... from the endocrine glands.
   a. Testis b. Salivary gland c. Gall bladder d. No correct answer
4. In gigantism the height of person may reach ....
   a. less than 0.5 meter. b. 2 meters. c. half meter. d. no correct answer.
5. .... is the most important hormone during pregnancy.
   a. Estrogen b. Progesterone c. Insulin d. Adrenalin

PART 2

Final Revision

Final Revision on :

Unit One : Chemical Reactions.

Unit Two : Electric Energy and Radioactivity.

Unit Three : Genes and Genetics.

Unit Four : Hormones.

Final Revision on Unit 1

1 Definitions (or scientific terms) :

1. Chemical reaction :	It is the breaking up of bonds in molecules of the reactants and formation of new bonds in the molecules of resultants (products) from the reaction.
2. Thermal decomposition reactions :	They are chemical reactions which involve the breaking up of the compounds by the effect of heat into its simple elements or simpler compounds than the original ones.
3. Chemical activity series :	It is the arrangement of metals in a descending order according to the degree of their chemical activity.
4. Simple substitution reactions :	They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.
5. Double substitution reactions :	They are chemical reactions in which double substitution (exchange) occurs between the ions (radicals) of two different compounds to give two other new compounds.
6. Neutralization reaction :	It is a reaction between an acid and an alkali to form salt and water.
7. Oxidation process :	A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance. **OR :** A chemical process where the atom loses an electron or more.
8. Reduction process :	A chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance. **OR :** A chemical process where the atom gains an electron or more.
9. Oxidizing agent (factor) :	It is the substance which gives oxygen or takes hydrogen away during a chemical reaction. **OR :** It is the substance which gains an electron or more during a chemical reaction.
10. Reducing agent (factor) :	It is the substance which takes oxygen away or gives hydrogen during a chemical reaction. **OR :** It is the substance which loses an electron or more during a chemical reaction.

11. The speed of chemical reaction :	It is the change in the concentration of the reactants and the resultants in a unit time.
12. Catalyst :	It is a substance which changes the rate of the chemical reaction without changing or being used up.
13. Positive catalytic reactions :	They are chemical reactions in which the catalyst increases their speeds.
14. Negative catalytic reactions :	They are chemical reactions in which the catalyst decreases their speeds.
15. Enzymes :	They are chemical substances produced by the body of living organism act as catalysts that increase the speed of biological reactions.

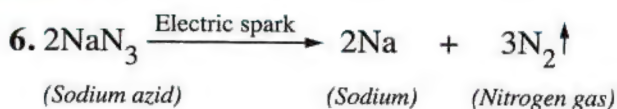
2 Importance or uses :

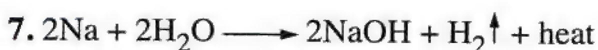
1. Catalysts :	They change (increase or decrease) the speed of chemical reactions.
2. Manganese dioxide :	A positive catalyst that increases the speed of decomposition of hydrogen peroxide.
3. Enzymes :	They act as catalysts that increase the speed of biological reactions.
4. Oxidase enzyme:	It increases the speed of decomposition of hydrogen peroxide.

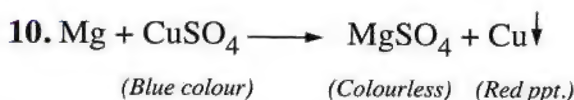
3 Chemical equations :

Thermal decomposition reactions.

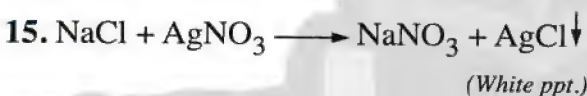
1. $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$
   (Red colour) *(Silver colour)*
2. $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$
   (Blue colour) *(Black colour)*
3. $CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$
   (Green colour) *(Black colour)*
4. $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$
   (Blue colour) *(Black colour)*
5. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$
   (White colour) *(Yellowish white colour)*

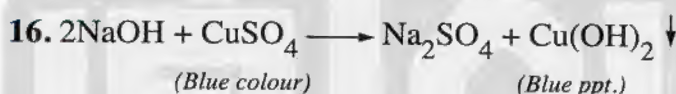




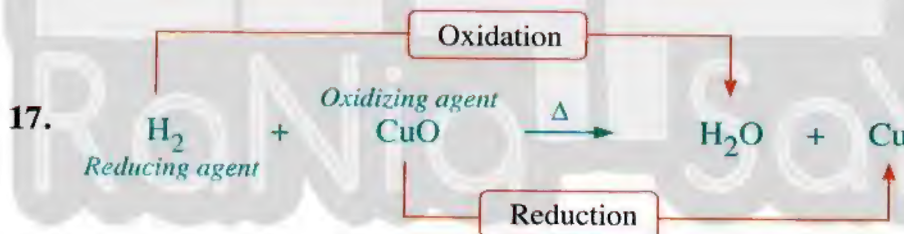


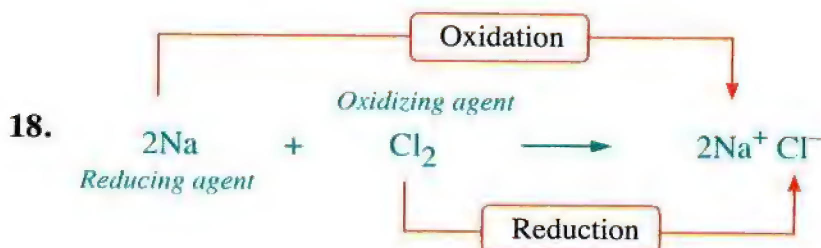
Simple substitution reactions.





Double substitution reactions.





Oxidation and reduction reactions.

4 Important tables :

1 Chemical activity series :

Element	Symbol
Potassium	K
Sodium	Na
Barium	Ba
Calcium	Ca
Magnesium	Mg
Aluminium	Al
Zinc	Zn
Iron	Fe
Tin	Sn
lead	Pb
Hydrogen	H
Copper	Cu
Mercury	Hg
Silver	Ag
Platinum	Pt
Gold	Au

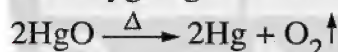
The degree of the chemical activity decreases

2 Formulae and colours of some elements and compounds :

Element or Compound	Formula	Colour
Copper	Cu	Red
Mercuric oxide	HgO	Red
Mercury	Hg	Silver
Copper hydroxide	$Cu(OH)_2$	Blue
Copper sulphate	$CuSO_4$	Blue
Copper oxide	CuO	Black
Copper carbonate	$CuCO_3$	Green
Sodium nitrate	$NaNO_3$	White
Sodium nitrite	$NaNO_2$	Yellowish white
Silver chloride	$AgCl$	White ppt.

5 Give reasons for :

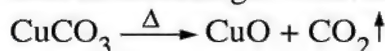
1. The formation of silvery colour by heating red mercuric oxide.
Due to decomposition of red mercuric oxide by heat into mercury (silvery precipitate) and oxygen gas evolves.


$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

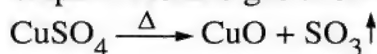
2. The formation of black substance by heating blue copper hydroxide.
Due to decomposition of blue copper hydroxide by heat into copper oxide (black) and water.

$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

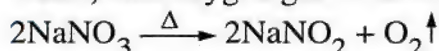
3. The formation of black substance by heating green copper carbonate.
Due to decomposition of green copper carbonate by heat into copper oxide (black) and carbon dioxide gas evolves.


$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

4. The blue colour of copper sulphate turns into black by heating.
Due to decomposition of blue copper sulphate by heat into copper oxide (black) and sulphur trioxide gas evolves.

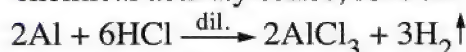

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

5. A yellowish white colour is formed on heating white sodium nitrate.
Due to decomposition of white sodium nitrate by heat into sodium nitrite (yellowish white) and oxygen gas evolves.


$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

PART 2

6. **The arrangement of metallic elements in the chemical activity series.**
To compare between elements concerning the degree of chemical activity, where the more active element replaces the less active one.

7. **Both aluminium and zinc react with diluted hydrochloric acid, while copper doesn't react with the same acid.**
Because both aluminium and zinc come before hydrogen in the chemical activity series, so they replace the hydrogen of acid, while copper comes after hydrogen in the chemical activity series, so it can't replace the hydrogen of acid.

$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

8. **Although aluminium comes before zinc in C.A.S., it takes more time than zinc to react with the acid.**
Due to the presence of a layer of aluminium oxide (Al_2O_3) on aluminium surface, which takes time to separate from aluminium, which delays the starting of occurrence of the reaction.

9. **Magnesium substitutes copper in copper sulphate solution, while the opposite cannot happen.**
Because magnesium comes before copper in the chemical activity series, so it replaces copper in copper sulphate solution, while copper comes after magnesium in the chemical activity series, so it can't replace magnesium.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

10. **A red precipitate is formed when magnesium is added to copper sulphate solution.**
Because magnesium comes before copper in the chemical activity series, so it replaces copper in copper sulphate solution and copper precipitates as a red ppt.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

11. **The blue colour of copper sulphate disappears on putting a piece of zinc in it.**
Because zinc comes before copper in the chemical activity series, so it substitutes copper in copper sulphate solution forming colourless zinc sulphate.

12. • **Tarek objected when he found one of his colleagues keeping silver nitrate solution in an aluminium containers.**
• **Don't keep silver nitrate solution in aluminium containers.**
Because aluminium comes before silver in the chemical activity series, so it substitutes silver in silver nitrate solution which leads to eroding of aluminium containers.

13. **The occurrence of effervescence on putting a piece of aluminium in diluted hydrochloric acid.**
Because aluminium comes before hydrogen in C.A.S., so it replaces hydrogen of diluted acids.

$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

14. A white precipitate is formed on adding silver nitrate solution to sodium chloride solution.

Due to formation of silver chloride salt which doesn't dissolve in water.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

15. In the reaction : $H_2 + CuO \longrightarrow Cu + H_2O$ hydrogen is considered as a reducing agent, while copper oxide is considered as an oxidizing agent.

Because hydrogen takes oxygen and reduces copper oxide to copper, while copper oxide gives oxygen and oxidizes hydrogen to water.

16. In the reaction : $2Na + Cl_2 \longrightarrow 2NaCl$ sodium is considered as a reducing agent, while chlorine is considered as an oxidizing agent.

Because sodium atom loses an electron and changes into positive (+ve) ion, while chlorine atom gains an electron and changes into negative (–ve) ion.

17. On the reaction between sodium with chlorine to form sodium chloride, oxidation and reduction processes occur, although absence of oxygen.

Because this reaction occurs by losing and gaining electrons.

18. Most metals are strong reducing agents, while most nonmetals are strong oxidizing agents.

Because metals tend to lose electrons during the chemical reaction, while nonmetals tend to gain electrons during the chemical reaction.

19. Oxidation and reduction are concurrent processes that happen at the same time.

Because the number of gained electrons in reduction process equals the number of lost electrons in oxidation process.

20. Reactions between ionic compounds are fast whereas, reactions between covalent compounds are slow.

Because the reactions of ionic compounds take place between ions, while the reactions of covalent compounds take place between molecules.

21. The reaction between sodium chloride solution and silver nitrate solution is from fast reactions.

Because it takes place between the ions produced from dissociation of each of them in water.

$Na^+Cl^- + Ag^+NO_3^- \longrightarrow Na^+NO_3^- + AgCl\downarrow$

22. A certain mass of iron filings reacts with acids faster than the reaction of a block of iron has the same mass with acids.

Because the surface area in case of iron filings is larger than that in case of iron block and the speed of chemical reactions increases by increasing the surface area.

23. Using nickel filings in hydrating oil instead of pieces of nickel.

Because the speed of chemical reactions increases by increasing the surface area.

24. The speed of chemical reaction increases by increasing the surface area of the reactants exposed to reaction.
Due to increasing the number of molecules of reactants exposed to reaction.

25. Burning the steel scourers used for cleaning aluminium in a jar full of pure oxygen is faster than its burning in atmospheric air.
Due to increasing the speed of chemical reaction by increasing the concentration of oxygen gas.

26. The speed of chemical reaction increases when the concentration of the reactants increases.
Because by increasing the number of reactants molecules, the number of probable collisions between them increases, so the speed of reaction increases.

27. The rate (speed) of chemical reaction increases by increasing temperature.
Because by increasing the temperature, the number of probable collisions between reactants molecules increases, so the speed of reaction increases.

28. If you want to cook food faster, you have to increase its temperature.
Because the speed of reactions of cooking food increases by rising temperature.

29. The fridge is used to preserve food.
Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which cause the rot of food.

30. Catalyst is used in some chemical reactions.
To increase the rate of chemical reactions.

31. Adding a few manganese dioxide power to hydrogen peroxide increases the number of evolved gas bubbles.
Because manganese dioxide acts as a catalyst which increases the speed of decomposition of hydrogen peroxide into water and oxygen gas.

32. Adding a piece of sweet potato increases the decomposition of hydrogen peroxide.
Because the oxidase enzyme in sweet potato acts as a catalyst which increases the rate of decomposition of hydrogen peroxide into water and oxygen gas.

6 What would happen when ... ?

1. Heating of red mercuric oxide.
A silvery precipitate of mercury is formed and oxygen gas evolves.

$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

2. Heating of copper hydroxide.
A black substance of copper oxide is formed and water vapour evolves.

$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

3. Heating of copper carbonate.

A black substance of copper oxide is formed and carbon dioxide gas evolves.

$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

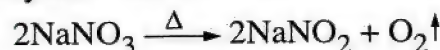
4. Heating of blue copper sulphate.

A black substance of copper oxide is formed and sulphur trioxide gas evolves.

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

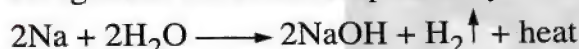
5. Heating of sodium nitrate.

A yellowish white substance of sodium nitrite is formed and oxygen gas evolves.


$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

6. Adding a piece of sodium to water.

An ignition occurs accompanied by a strong pop sound.


$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$

7. Adding diluted HCl to a piece of copper.

No reaction occurs

8. Adding diluted HCl to zinc turnings.

Zinc reacts with dil. HCl immediately and hydrogen gas evolves.

$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

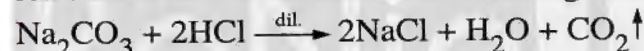
9. Adding magnesium ribbon to blue copper sulphate solution.

The blue colour of copper sulphate disappears and a red precipitate of copper is formed.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

10. Adding diluted hydrochloric acid to sodium carbonate salt.

An effervescence occurs due to evolving of bubbles of carbon dioxide gas.


$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

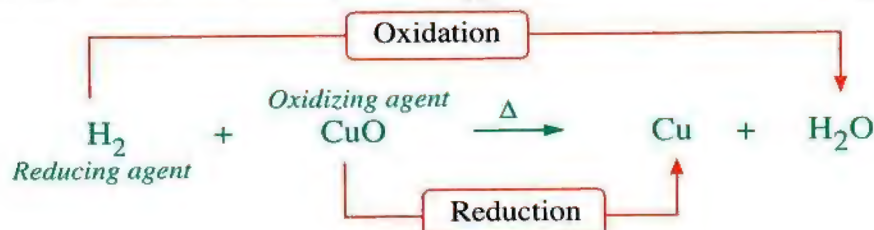
11. Adding silver nitrate solution to sodium chloride solution.

A white precipitate of silver chloride is formed.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

12. Passing hydrogen gas over hot copper oxide.

Hydrogen is oxidized into water, while copper oxide is reduced into copper.



13. Sodium atom loses an electron during the chemical reaction.

It is oxidized and changed into a positive sodium ion and it became a reducing agent.

$Na \xrightarrow{oxidation} Na^+ + e^-$

14. Chlorine atom gains an electron during the chemical reaction.

It is reduced and changed into a negative chloride ion and it became an oxidizing agent.

$Cl_2 + 2e^- \xrightarrow{\text{reduction}} 2Cl^-$

15. Breaking up the reactants used in chemical reactions.

The surface area exposed to reaction increases, so the speed of chemical reaction increases.

16. Using diluted hydrochloric acid instead of concentrated hydrochloric acid in the reaction.

The speed (rate) of chemical reaction decreases.

17. Adding sodium hydroxide solution to blue copper sulphate solution.

The blue colour of copper sulphate disappears and blue precipitate of copper hydroxide is formed.

$2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2\downarrow$

18. Putting two effervescent tablets in two beakers, one of them contains cold water and the other contains hot water.

An effervescence happens and the effervescence occurred in case of hot water is faster than in case of cold water.

19. Leaving of food in summer days outside the fridge.

Food becomes rotten due to increasing chemical reactions done by bacteria.

20. The temperature of the reaction increases.

The speed (rate) of chemical reaction increases.

21. Replacing of iron filings by a piece of iron has the same mass on reacting with diluted acids.

The speed of the chemical reaction decreases.

22. Increasing the surface area exposed to reaction "related to the number of reacting molecules and the rate of the reaction".

The number of reacting molecules increases and the rate of the reaction increases.

23. Increasing the concentration of the reactants.

The speed of the chemical reaction increases.

24. Increasing the temperature of the reaction "related to the number of collisions".

The number of collisions between molecules increases.

25. Adding a few MnO_2 powder to hydrogen peroxide.

Hydrogen peroxide decomposes (breaks up) rapidly into water and oxygen gas evolves.

26. Putting a piece of sweet potato in a flask containing hydrogen peroxide.

The rate of decomposition of hydrogen peroxide increases.

27. Adding a negative catalyst to a rapid reaction.

The speed of the reaction will be decreased.

7 Comparisons :

1 Heating of metal oxide and metal hydroxide :

Heating of metal oxide	Heating of metal hydroxide
Metal oxide decomposes by heat into metal and oxygen gas evolves. *Ex. :* $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$	Metal hydroxide decomposes by heat into metal oxide and water vapour. *Ex. :* $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

2 Simple substitution reactions and double substitution reactions :

P.O.C.	Simple substitution reactions	Double substitution reactions
Definition :	They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.	They are chemical reactions in which double substitution (exchange occurs between the ions (radicals) of two different compounds to give two other new compounds.
Types :	* A metal substitutes the hydrogen of water. * A metal substitutes the hydrogen of diluted acid. * A metal substitutes another one in its salt solution.	* An acid with an alkali. * An acid with a salt. * A salt solution with another salt solution.

3 Oxidation and reduction processes :

P.O.C.	Oxidation	Reduction
Traditional concept :	A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance. $H_2 \xrightarrow{Oxidation} H_2O$	A chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance. $CuO \xrightarrow{Reduction} Cu$
Electronic concept :	A chemical process where the atom loses an electron or more. $Na \xrightarrow{Oxidation} Na^+ + e^-$	A chemical process where the atom gains an electron or more. $Cl_2 + 2e^- \xrightarrow{Reduction} 2Cl^-$

4 Oxidizing agent and reducing agent :

Oxidizing agent	Reducing agent
* It is the substance which gives oxygen or takes hydrogen away during a chemical reaction. * It is the substance which gains an electron or more during a chemical reaction. * A reduction process occurs to it.	* It is the substance which takes oxygen away or gives hydrogen during a chemical reaction. * It is the substance which loses an electron or more during a chemical reaction. * An oxidation process occurs to it.

PART 2

5 Covalent compounds and ionic compounds :

Covalent compounds	Ionic compounds
They are slow reacting compounds, because they don't break up into ions.	They are fast reacting compounds, because they break up into ions.
The reaction takes place between molecules.	The reaction takes place between ions.

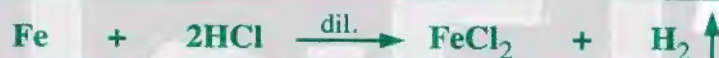
8 Activities :

ACTIVITY 1 The effect of surface area on the speed of chemical reaction :

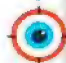
Procedures :

1. Bring two flasks, then put in one of them iron filings and in the other a piece of iron has the same mass.
2. Pour equal amounts of dil. HCl acid in both flasks.
3. Compare between the speed of the two reactions.

Equation of the reaction :



$$Fe + 2HCl \xrightarrow{dil.} FeCl_2 + H_2 \uparrow$$



Observation :

The rate of reaction of hydrochloric acid with iron filings is faster than that in case of a piece of iron.

Explanation :

The surface area of iron filings exposed to the reaction with acid is more than the surface area of the iron piece, so the reaction in case of iron filings ends in a short time than that in case of iron piece.

Conclusion :

The speed of chemical reaction increases by increasing the surface area of the reactants exposed to the reaction.

ACTIVITY 2 The effect of reactants concentration on the speed of chemical reaction :

Procedures :

1. Bring two flasks, then put in each of them a piece of magnesium ribbon.
2. Put a small amount of dil. HCl in one of them, and put the same amount of conc. HCl in the other.
3. Compare between the number of the evolved bubbles (the amount of the gas formed) after a certain period of time in the two reactions.

Equation of the reaction :

$$Mg + 2HCl \longrightarrow MgCl_2 + H_2\uparrow$$

Observations :

1. The number of the evolved bubbles in case of using conc. hydrochloric acid is more than that in case of dil. hydrochloric acid.
2. The rate of the reaction of magnesium ribbon with conc. hydrochloric acid is faster than that in case of dil. hydrochloric acid.

Explanation :

The number of molecules of acid in concentrated solution is more than that its number in diluted solution which leads to increasing the number of probable collisions between reactant molecules, so the speed of chemical reaction increases.

Conclusion :

The speed of chemical reaction increases by increasing the concentration of the reactants.

ACTIVITY 3 The effect of temperature on the speed of chemical reaction :

Procedures :

1. Bring two glass beakers have two equal volumes of water, one of them is hot and the other is cold.
2. Add an effervescent tablet to each glass beaker.
3. Compare between the speed of occurrence of effervescene in the two beakers.

Observation :

The effervescence happens in case of hot water is faster than that in case of cold water.

Explanation :

The speed of the reactant molecules in case of hot water is greater than that its speed in case of cold water which leads to increasing the number of probable collisions between reactant molecules, so the speed of the chemical reaction increases.

Conclusion :

The speed of chemical reaction increases by increasing the temperature of the reaction.

PART 2

ACTIVITY 4 The effect of catalyst on the speed of chemical reaction :

Procedures :

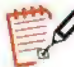
1. Bring a glass beaker and put in it an amount of hydrogen peroxide, then add a little amount of manganese dioxide powder to it.
2. Compare between the number of the evolved bubbles before and after adding manganese dioxide.

Observation :

Increasing the number of the evolved bubbles on adding manganese dioxide powder to hydrogen peroxide.

Explanation :

Manganese dioxide is a catalyst that increases the speed of decomposition of hydrogen peroxide into water and oxygen that evolves as bubbles.



Conclusion :

The speed of chemical reaction increases by adding a catalyst.

ACTIVITY 5 The effect of enzymes on the speed of chemical reaction :

Procedures :

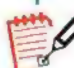
1. Bring a glass beaker, then add an amount of hydrogen peroxide in it.
2. Put a piece of sweet potato in the glass beaker.
3. Compare between the number of the evolved bubbles before and after adding a piece of sweet potato.

Observation :

Increasing the number of the evolved bubbles on adding a piece of sweet potato to hydrogen peroxide.

Explanation :

Oxidase enzyme in sweet potato acts as a catalyst which increases the rate of decomposition of hydrogen peroxide into water and oxygen.



Conclusion :

The speed of chemical reaction increases by adding an enzyme.

9 Main points :

1 Types of chemical reactions :

- Thermal decomposition reactions.
- Substitution reactions.
- Oxidation and reduction reactions.

2 The difference of chemical reactions in the speed of their occurrence :

Chemical reaction	The speed of its occurrence
• Reaction of fireworks.	• Very fast (It occurs in very short time).
• Reaction of oil with caustic soda to form soap.	• Relatively slow (It occurs in short time).
• Reaction of rusting of iron.	• Very slow (It needs several months).
• Reaction of formation of petroleum oil inside the Earth.	• Too slow (It needs millions of years).

3 Factors affecting the speed of chemical reaction :

- The nature of the reactants.
- The concentration of the reactants.
- The temperature of the reaction.
- Catalysts.

4 The nature of the reactants :

The nature of the reactants is related to :

1. The kind of bonding in the reactants.
2. The surface area of the reactants exposed to reaction.

5 The kind of bonding in reactants :

There are two kinds of compounds :

1. Covalent compounds
2. Ionic compounds

6 Common properties of catalysts :

1. They change the speed of reaction but don't affect either its beginning or stopping.
2. They are used in a small amounts which are often enough to complete the reaction.
3. They are bonded to reactants during the reaction but get separated from them (quickly) to form the resultants at the end of the reaction.
4. They decrease the energy needed for the reaction.
5. No chemical change or decrease in mass occur to the catalyst after ending the reaction.

PART 2

10 Science, Technology and Society :

Most of modern cars are equipped with :

1. Air bags.
2. Catalytic converter .

1 Air bags :

Importance	Idea of operation
- They are considered as one of the most important safety means in cars at emergencies.	- On the occurrence of a car accident (crash) or a sudden drop in the speed of the car, an electric spark is generated works on decomposition and explosion of the substance of sodium azid forming sodium and nitrogen gas evolves. - The bag gets inflated by nitrogen gas at an extreme speed (within only 40 mm second), then it gets vacuumed rapidly to ensure clear vision and proper movement of the driver. $2NaN_3 \xrightarrow{\text{Electric spark}} 2Na + 3N_2\uparrow$ Sodium azid → Sodium + Nitrogen gas

2 Catalytic converter :

Structure	Importance	Idea of operation
- It is composed of ceramic cells (similar to bee cells) covered with a thin layer of a catalytic metal as platinum or palladium.	- It helps in the treatment of harmful gases emitted from the car engine.	- Ceramic cells are similar to bee cells which increase the surface area of the catalytic substance exposed to the current of the emitted gases from the engine so as to economize the use of expensive metals. - The catalysts increase the speed of reactions of the treatment of the harmful gases emitted from the engine.

Final Revision on Unit 2

1 Definitions (or scientific terms) :

1. Electric current :	It is the flow of electric negative charges (electrons) through a conductor.
2. Electric current intensity :	It is the quantity of electric charges in coulomb flowing through a cross-section of the conductor in one second.
3. The ampere :	- It is the electric current intensity passing through a circuit when a charge of one coulomb passes through a given cross-section in one second. - It is the current intensity passing through a conductor whose resistance is one ohm and the potential difference across its terminals is one volt.
4. The coulomb :	It is the quantity of charge transferred by a constant current of intensity one ampere in time of one second.
5. Electric potential of a conductor :	It is the condition (state) of an electric conductor that shows the transfer of the electricity from or to it when it is connected to another conductor.
6. Potential difference across a conductor :	It is the value of the work done to transfer a quantity of charge (one coulomb) between the two ends of this conductor.
7. The volt :	- It is the potential difference across two terminals of a conductor on doing a work of one joule to transfer a quantity of charge of one coulomb. - It is the potential difference across the two terminals of a conductor whose resistance is one ohm and the current intensity passing through it is one ampere.
8. The electromotive force (e.m.f.) :	It is the potential difference between the two poles of the electric source when the circuit is open.
9. The electric resistance :	- It is the obstruction (opposition) that the electric current faces during its passing through a conductor. - It is the ratio between the potential difference across the two ends of a conductor and the current intensity passing through it.
10. The ohm :	- It is the resistance between two points of a conductor that has an electric current passing through it of intensity one ampere when the potential difference between these points is one volt. - It is the resistance of a conductor which allows passing of an electric current intensity of one ampere when the potential difference across its terminals is one volt.

PART 2

11. The variable resistance :	It is the resistance which can be varied in order to control the current intensity and the potential difference in the different parts of the circuit.
12. Ohm's law :	The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.
13. Electrochemical cells :	They are the cells in which the chemical energy is converted into electric energy.
14. Electric generators (Dynamoes) :	They are the devices in which the mechanical (kinetic) energy is converted into electric energy.
15. Direct electric current (D.C.) :	It is an electric current which has a constant intensity and flows in one direction in the electric circuits.
16. Alternating electric current (A.C.) :	It as an electric current which has a variable intensity and flows in two opposite directions in the electric circuits.
17. Radioactive elements :	They are elements whose atoms' nuclei contain a number of neutrons more than the number required for its stability.
18. Radioactivity phenomenon (Natural radioactivity) :	It is the spontaneous decay of the atoms' nuclei of radioactive elements that are present in nature in an attempt to achieve a more stable composition.
19. Artificial radioactivity :	It is the radiation or nuclear energy that is either released during nuclear reactions or nuclear bombs.
20. Radiation pollution :	It is the increase of the amount of radiation in the environment.
21. Physical effects due to radiation :	They are changes that appear on a living being, as a result of exposure to radiation.
22. Genetic effects due to radiation :	They are changes in the sex chromosomes composition which result in abnormal birth.
23. Cellular effects due to radiation :	They are changes in the cells composition which lead to destroying the cells.
24. Isotopes :	They are atoms of the same element with the same number of protons and with different number of neutrons.
25. Rem :	It is the measuring unit of absorbed radiation.

2 What is meant by.....?

1. An electric charge of 20 coulomb flows through a cross-section of a conductor in 5 second :	This means that the electric current intensity passing through this conductor is $\frac{20}{5}$ = 4 ampere.
2. The electric current intensity passing through a conductor is 1.5 ampere :	This means that the quantity of electric charge that passes through the conductor in one second equals 1.5 coulomb.

3. A work of 10 joule is done to transfer a charge of 5 coulomb between two points :	This means that the potential difference across the two points equals $\frac{10}{5}$ = 2 volt .
4. The potential difference across two points of a conductor is 5 joule/coulomb :	This means that the work done to transfer one coulomb between two ends of this conductor is 5 joule .
5. The electromotive force of an electric cell is 1.1 volt :	This means that the potential difference between the two poles of the electric cell when the circuit is open is 1.1 volt .
6. The resistance of a conductor is 2 ohm :	This means that the ratio between the potential difference across the two ends of the conductor and the current intensity passing through it is 2 ohm .
7. The potential difference across a conductor of resistance 3 ohm is 6 volt :	This means that the current intensity passing through this conductor is $\frac{6}{3}$ = 2 ampere .
8. The current intensity passing through a conductor of resistance 1 ohm is 5 ampere :	This means that the potential difference across the two terminals of the conductor is 5 volt .
9. An electric current of 3 ampere flows through a conductor and the potential difference across its terminals is 15 volt :	This means that the resistance of this conductor equals 5 ohm .

3 Measuring units :

Physical quantity	Measuring unit
- The potential difference (V) between two points. - The (e.m.f.) of an electric cell.	Volt
The quantity of electricity (q).	Coulomb
The time (t).	Second
The work (W).	Joule
The intensity of the electric current (I).	Ampere
The electric resistance (R).	Ohm
The absorbed radiation.	Rem

4 Important laws and solved problems :

1. Current intensity (I) = $\frac{\text{Quantity of charge (q)}}{\text{Time in seconds (t)}}$

$\therefore$ 1 ampere = $\frac{\text{1 coulomb}}{\text{1 second}}$

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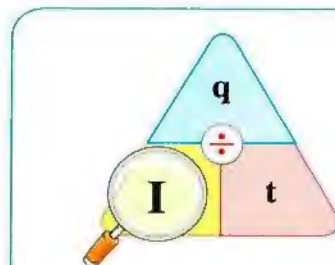
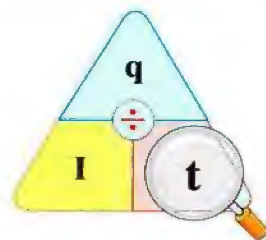
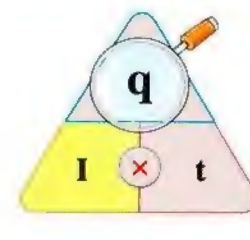


To find the current intensity



To find the time



To find the quantity of charge

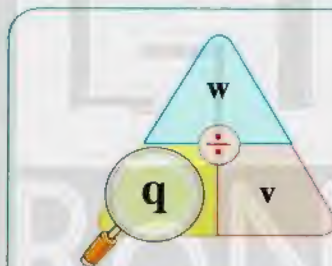
Problem : *The electric current intensity that flows through a wire, if a charge of 6 coulomb passes through it in 3 second.*

Solution

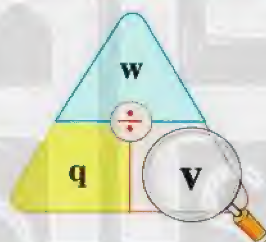
Current intensity (I) = $\frac{q}{t} = \frac{6}{3}$ = 2 ampere.

2. Potential difference (V) = $\frac{\text{Work (W)}}{\text{Quantity of electricity (q)}}$

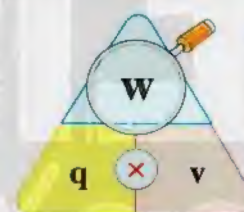
$\therefore$ 1 Volt = $\frac{\text{1 Joule}}{\text{1 Coulomb}}$



To find the quantity of electricity



To find the potential difference



To find the work

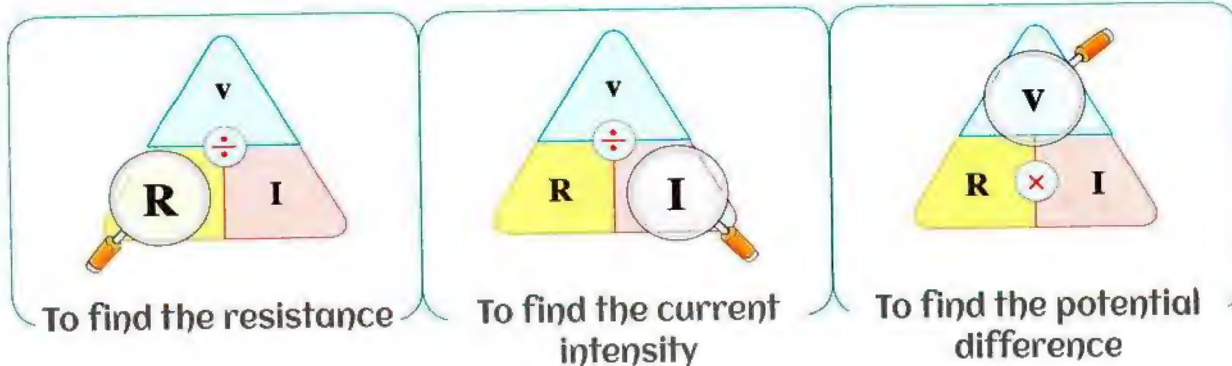
Problem : *If the work done to transfer a unit charge of 20 coulomb through a wire of a conductor is 1000 joule. Calculate the potential difference between the two ends of the conductor.*

Solution

Pot. diff. (V) = $\frac{W}{q} = \frac{1000}{20}$ = 50 volt.

3. The electric resistance (R) = $\frac{\text{The potential difference (V)}}{\text{The current intensity (I)}}$

$\therefore$ 1 Ohm = $\frac{\text{1 Volt}}{\text{1 Ampere}}$



Problem : *Calculate the potential difference of the two ends of a vacuum cleaner whose resistance is 22 ohm and the current intensity passing through it is 10 ampere.*

Solution

The resistance (R) = $\frac{V}{I}$ $\therefore V = IR = 10 \times 22 = 220$ volt.

4. [A] The electromotive force of a group of different dry cells connected in series = the sum of the electromotive forces of these cells.

$$E_{battery} = E_1 + E_2 + E_3 + \cdots$$

[B] The electromotive force of a group of similar dry cells connected in series = the number of the cells (n) × the electromotive force of one cell.

$$E_{battery} = n \times E_1$$

[C] The electromotive force of a group of similar dry cells which are connected in parallel is equal to the e.m.f. of one cell.

$$E_{battery} = E_1$$

[D] The e.m.f. of the battery = e.m.f. of cells connected in series + e.m.f. of cells connected in parallel

Problem : *You have three similar cells, the e.m.f. of each is 1.5 volt. Explain by using a diagram, how you can connect them to obtain an e.m.f. of :*

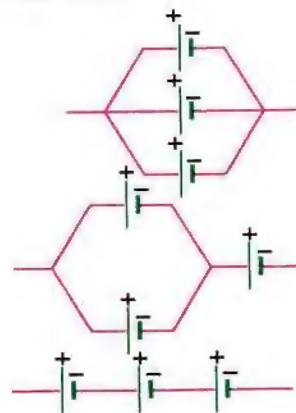
a. 1.5 volt. *b. 3 volt.* *c. 4.5 volt.*

Solution

a. All cells are connected in parallel.

b. Two cells are connected in parallel and are connected in series with the third.

c. All cells are connected in series.



PART 2

5 Important symbols :

The symbols in the electric circuit :

(1) Voltmeter	(2) Ammeter	(3) Resistance	
		Fixed	Variable (Rheostat)
—(V)—	—(A)—		

(4) Key		(5) Electric source		(6) Electric lamp
Open	Closed	Electric cell	Battery	
		(+) (−)	(+) (−)	

(7) Series connection of electric cells	(8) Parallel connection of electric cells
+ +− +− +− −	+ +− +− +− −

6 Importance or uses :

1. Ammeter :	It is used for measuring the electric current intensity.
2. Voltmeter :	**It is used for measuring :** a. The potential difference across two ends of a conductor. b. The electromotive force of the battery.
3. Ohmmeter :	It is used for measuring the electric resistance.
4. Rheostat :	It is used to control the current intensity and potential difference in the electric circuit.
5. The simple cell or the dry cell :	• It changes the chemical energy into electric energy. • It produces direct current.
6. The electric generator (Dynamo) :	• It changes the kinetic energy into electric energy. • It produces alternating current.
7. Direct current :	It is used in electroplating processes and in operating of some electric machines (appliances).

8. Alternating current :	It is used in lighting houses and in operating of electric appliances.
9. Connection of dry cells in series :	To obtain a battery, the e.m.f. of it is high.
10. Connection of dry cells in parallel :	To obtain a battery, the e.m.f. of it is low.
11. The uses of nuclear energy in the :	
a. Medical field :	– To treat and diagnose diseases like cancer.
b. Agricultural field :	– To eliminate pests and to improve some plants races.
c. Industrial field :	– To convert sand to silicon sheets which is used in manufacturing of computer processors and programmed electric circuits that are used in electric appliances. – To discover defects in the manufactured products.
d. Electricity generation field :	– To heat water to produce steam used to operate turbines and to generate electricity.
e. Space exploration field :	– It is used as a nuclear fuel for rockets that fly in the space.
f. Drilling field :	– For drilling of petroleum and underground water.

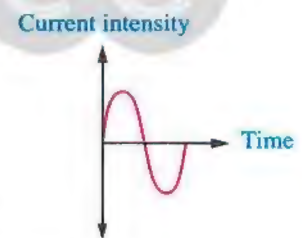
7 Scientists and their contributions :

Ohm :	He deduced the relation between the electric current and the potential difference which is known as after him by Ohm's law.
Henri Becquerel :	• He discovered the radioactivity phenomenon. • He discovered the emission of unseen rays from the uranium element that has the ability to penetrate solid objects.
Dr. Aly Mostafa Moshrafa :	• He has great theories in the fields of atom and radiation. Basics of manufacturing the atomic bomb were based on his theories. • He gave his objection to this matter and called for the necessity of exploiting the atom and radiation for the benefit of humanity.

8 Give reasons for :

1. **The electric energy is the cleanest source of energy.**
   Because it does not pollute the environment.
2. **The atom is electrically neutral.**
   Because the number of protons in the nucleus equals the number of electrons that rotate around it.
3. **The nucleus is positively charged.**
   Because it contains protons (positively charged) and neutral neutrons.

4. **The electrons still rotate around the nucleus.**
Due to the attraction force between the protons in the nucleus and electrons.
5. **The electrons may leave the atom and move freely.**
Due to the weakness of the attraction force between the protons and electrons.
6. **The current flows through the circuit only when it is closed.**
Because when the circuit is closed, all its components are connected.
7. **In the electric circuit, the ammeter is connected in series.**
To measure the electric current intensity passing through the circuit.
8. **When two conductors have the same potential are connected, no electric current passes.**
Because there is no potential difference between them.
9. **If the electric current intensity passing through the same conductor increases, then the potential difference across its terminals increases.**
Because the electric current intensity passing through a conductor is directly proportional to the potential difference across it.
10. **The voltmeter is connected across the two ends of a conductor.**
To measure the potential difference across the two terminals of the conductor.
11. **The voltmeter is connected across the two poles of a battery.**
To measure the electromotive force of the battery.
12. **If you need to charge your mobile phone, you should use the electric transformer.**
To reduce the electric potential of the current used and get a suitable electric potential to charge the mobile.
13. **The rheostat is used in the electric circuit.**
To control the electric current intensity passing through the circuit and the potential difference in the different parts of the circuit.
14. **The rheostat controls the current intensity flowing through the electric circuit.**
Because if we increase the length of the wire, the resistance increases and the current intensity decreases and vice versa.
15. **The opposite graph represents the alternative current.**
Because it is variable in both direction and intensity.



16. **The alternating current is preferred than the direct current.**
Because : - It can be transferred for long distances through wires.
- It can be changed into a direct current.
17. **Electric current produced from electric generators is used in lighting and operating electric appliances.**
Because it is an alternating current which is variable in both direction and intensity and it can be changed into a direct current.
18. **Some cells are connected in the electric circuit in series.**
To obtain a battery, the e.m.f. of it is high.
19. **Some cells are connected in the electric circuit in parallel.**
To obtain a battery, the e.m.f of it is low.

20. The electromotive force of a battery whose cells are connected in series is greater than that one whose cells are connected in parallel.
Because the total e.m.f. for a group of cells connecting in series is equal to the sum of the e.m.f. for these cells, while the total e.m.f. for a group of cells connecting in parallel is equal to the e.m.f. of one cell.

21. The mass of the atom is concentrated in the nucleus.
Because the mass of electrons is negligible compared with the mass of protons and neutrons in the nucleus.

22. Binding the atom's nucleus although it has a repulsion force.
Due to nuclear binding force which overcomes the repulsion force between protons.

23. The nuclei of radioactive elements are unstable.
Due to their excess energy as a result of their atoms' nuclei containing neutrons more than required for their stabilization.

24. The atom's nuclei of radioactive elements emit invisible radiations as alpha particles, beta particles and gamma radiations automatically.
To get rid of the excess energy to acheive a more stable composition.

25. Some elements are called radioactive elements.
Because they release unseen rays spontaneous as a result of their atoms' nuclei containing neutrons more than required for their stabilization.

26. Uranium is one of the radioactive elements.
Because the nucleus of its atom contains a number of neutrons more than the number required for its stability which causes the presence of excess energy emitted in a form of invisible (unseen) radiation.

27. Radioactivity has natural sources and also artificial.
Because there are natural radioactivity which is produced from the radioactive elements present in the nature and cosmic radiation that comes from outer space, and artificial radioactivity which is produced from nuclear reactions and nuclear bombs.

28. Radiation pollution occurs.
Due to the increase of the amount of radiation in the environment.

29. Explosion of the Russian Chernobyl reactor.
Due to an error in operation.

30. After the Chernobyl accident, radioactive isotopes were found in the food products.
Due to the transference of polluted atomic cloud by the wind, then rain fell and radioactive isotopes transferred to the soil and polluted plants and animals.

31. The radiation pollution may be occured in areas at which a nuclear explosion is not occured.
Because the radiation pollution may be transferred by the dry fallen by wind or by falling of rains to the Earth's surface.

32. The exposure to a large radiation dosage for a short time leads to decrease in the number of red blood cells.
Due to the damage of bone marrow which is responsible for the formation of red blood cells.

33. Radiation has genetic effects.

Because radiation causes changes in the sex chromosomes composition for living organisms.

34. Workers with radioactive elements must wear radiation protective gloves, clothes and masks.

To protect themselves from radiation pollution.

35. The radioactive wastes should be buried away from underground water's path.

To not pollute water.

36. The areas chosen for storing radioactive wastes should be steady.

To prevent the spread of radiation to other areas.

9 What would happen when ... ?

1. **Vanishing or decreasing the attraction force in the atom between the nucleus and the electrons in the outer level.**
   The electrons in the outer level become free.
2. **Two electrically charged conductors of different electric potential are connected by a wire.**
   The electric current will flow from the conductor that has the higher electric potential to the other.
3. **Two conductors have the same electric potential are connected by a wire.**
   No electric current will pass through them, because there is no potential difference between them (Potential difference = zero).
4. **A quantity of charges that passes through a cross-section of a conductor in one second increases.**
   The electric current intensity will increase.
5. **The time of flowing the electric charges through a certain cross-section of a conductor is doubled.**
   The electric current intensity decreases to its half.
6. **The length of the rheostat wire which enters in the circuit increases.**
   The resistance increases and the current intensity decreases.
7. **The circuit of Ohm's law doesn't contain variable resistance.**
   The current intensity and the potential difference can't be controlled and it doesn't verify Ohm's law.
8. **The potential difference between the terminals of a conductor is doubled at a constant temperature (for the current intensity).**
   The current intensity is doubled.
9. **Increasing the resistance of the rheostat in the Ohm's electric circuit.**
   The ammeter reading decreases and the voltmeter reading decreases (V & I).
10. **The fixed resistance is spoiled in the Ohm's circuit (concerning the ammeter reading).**
    The ammeter reading is zero, because no current passes through the circuit as it is open.

11. Ammeter and voltmeter readings used in verifying Ohm's law if the resistance is burnt.
If the resistance is burnt, the current will not pass in the circuit (opened circuit), so the reading of ammeter = zero and the reading of voltmeter is equal to the electromotive force of the battery.

12. A group of electric cells are connected in series (related to e.m.f.).
The total e.m.f. increases.

13. A group of similar electric cells are connected in parallel (related to e.m.f.).
The e.m.f. equals the e.m.f. of one cell.

14. • Some of atoms nuclei containing number of neutrons more than the number required for its stability.
• The number of neutrons in the atom of the nucleus of an element increases more than the number required for its stability.
Its energy increases, so it emits unseen (invisible) radiations to reach a more stable composition.

15. A man is exposed for a large dosage of radiation for a short time.
This may lead to the damage of :
• Bone marrow. • Spleen. • Digestive system. • Central nervous system.

16. The red blood cells decrease in the human body.
This will lead to :
• Feeling of being sick.
• Sore throat accompanied by nausea, vertigo and diarrhea.

17. A man is exposed for a small dosage of radiation for a long time.
This will lead to :
• Physical effects. • Genetic effects. • Cellular effects.

10 Comparisons :

1 Ammeter and voltmeter :

Points of comparison	Ammeter	Voltmeter
1. Used for measuring :	The current intensity (I) in an electric circuit.	a. The electromotive force (e.m.f.) of an electric source. b. The potential difference (V) between two points in an electric circuit.
2. Measuring unit :	Ampere	Volt
3. Its symbol in the electric circuit :	–(A)–	–(V)–
4. Type of connection in the electric circuit :	Series connection.	Parallel connection.

PART 2

2 Electric current intensity, potential difference and electric resistance :

Points of comparison	Electric current intensity (I)	Potential difference (V)	Electric resistance (R)
1. Definition :	It is the amount of electric charges passing through a given cross-section of the conductor in one second.	It is the work done in joules to transfer a unit charge (one coulomb) through a wire of a conductor.	It is the ratio between the potential difference across the conductor and the current intensity passing through it.
2. Measuring unit :	Ampere	Volt	Ohm
3. The apparatus used :	Ammeter	Voltmeter	Ohmmeter
4. Law used :	Current intensity (I) $= \frac{\text{quantity of charge (q)}}{\text{time in seconds (t)}}$	Potential difference (V) $= \frac{\text{work done (W)}}{\text{quantity of electricity (q)}}$	Resistance (R) $= \frac{\text{potential difference (V)}}{\text{current intensity (I)}}$

3 Series connection and parallel connection :

Points of comparison	The series connection	The parallel connection
The produced e.m.f. :	• The (e.m.f.) of a group of similar dry cells connected in series = the number of the cells (n) × the electromotive force of one cell. $E_{(battery)} = n \times E_1$ • The (e.m.f.) of a group of different dry cells connected in series = the sum of the (e.m.f.) of these cells. $E_{(battery)} = E_1 + E_2 + E_3 + ...$ • It is used to obtain high (e.m.f.).	• The (e.m.f.) of a group of similar dry cells connected in parallel = the (e.m.f.) of one cell. $E_{(battery)} = E_1$ • It is used to obtain low (e.m.f.).
The diagrammatic figure :	+ + + + − − − −	+ − + − + − + −

4 Direct current and alternating current :

Direct current (D.C.)	Alternating current (A.C.)
1. It is unidirectional and has constant intensity.	1. It is variable in both direction and intensity.
2. It is produced from the electrochemical cells.	2. It is produced from the electric generators.
3. It cannot be changed into an alternating current.	3. It can be changed into a direct current.
4. It cannot be transferred for long distances.	4. It can be transferred for long distances.
5. It is used in electroplating processes and in operating of some electric appliances.	5. It is used in lighting houses and in operating electric appliances.

5 Nuclear reactions and nuclear bombs :

Nuclear reactions	Nuclear bombs
They can be controlled.	They can't be controlled.
They are used in safe uses.	They are used in military uses.

6 Genetic effects and cellular effects produced from radiation :

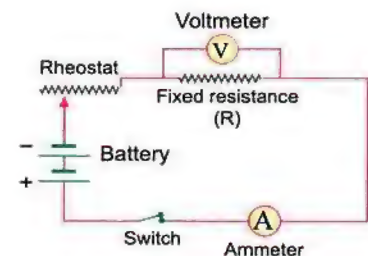
Genetic effects	Cellular effects
They are changes in the sex chromosomes composition which result in abnormal birth.	They are changes in the cells composition.

11 Activities :

ACTIVITY 1 To discover the relation between current intensity and potential difference :

Steps :

1. Connect an electric circuit (as shown in the fig.) which consists of a battery, a rheostat, a voltmeter (V), a conductor (has fixed resistance), an ammeter (A), and a switch.



2. Close the switch, then adjust the variable resistance (rheostat) till find the suitable reading of the voltmeter and the ammeter.
3. Repeat the previous step several times by changing the variable resistance each time and record your reading in a table.

PART 2

4. Calculate the value of $\frac{V}{I}$ in each case.

Exp. No.	Ammeter reading I (ampere)	Voltmeter reading V (volt)	$R = \frac{V}{I}$
1	0.1	1	10
2	0.2	2	10
3	0.3	3	10

Observation :

The ratio = $\frac{\text{Potential difference (V)}}{\text{Current intensity (I)}}$ = **Constant value.**

i.e. $V \propto I$ $\therefore V = \text{Constant} \times I$

The constant value is given by the symbol (R) and it is equal to the resistance of the conductor. $\therefore V = R \times I$

Conclusion :

The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.

ACTIVITY 2 To measure the electromotive force (e.m.f.) of electric cells connected in series :

Tools :

Three similar dry cells, voltmeter, connecting wires.

Procedures :

1. • Connect an electric circuit which consists of one cell and a voltmeter as shown in Fig. (a)
   • Record the reading of the voltmeter (let it be E_1).

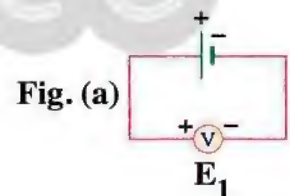


Fig. (a)

2. • Connect another similar cell to the first cell in series as shown in Fig. (b).
   • Record the reading of the voltmeter in this case (let it be E_2).

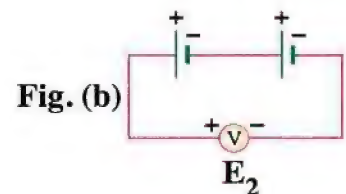


Fig. (b)

3. • Connect another similar cell in series as shown in Fig. (c).
   • Record the reading of the voltmeter in this case (let it be E_3).

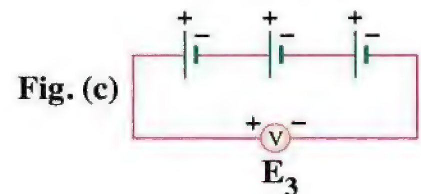


Fig. (c)

Observations :

- The reading of voltmeter in the second case is twice the e.m.f. in the first case.

  i.e. (E_2) is twice (E_1).

- The e.m.f. in the third case is three times the e.m.f. in the first case.

  i.e. (E_3) equals three times (E_1).

Conclusion :

1. The electromotive force of a group of **different** dry cells connected **in series** = the sum of the electromotive forces of these cells.

$$\therefore E_{(battery)} = E_1 + E_2 + E_3 + \ldots\ldots\ldots\ldots$$

2. The electromotive force of a group of **similar** dry cells joined **in series** = the number of the cells (n) × the electromotive force of one cell.

$$\therefore E_{(battery)} = n \times E_1$$

ACTIVITY 3 To measure the electromotive force (e.m.f.) of electric cells connected in parallel :

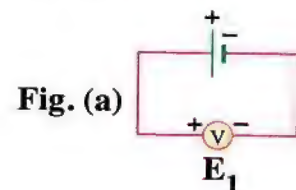
Tools :

Three similar electric cells, voltmeter, electric conducting wires.

Procedures :

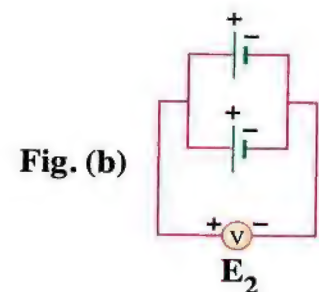
1. • Connect an electric circuit containing one cell and a voltmeter as shown in Fig. (a).
   • Record the reading of the voltmeter (let it be E_1).

Fig. (a)



2. • Connect another cell parallel to the first as shown in Fig. (b).
   • Record the reading of the voltmeter in this case (let it be E_2).

Fig. (b)



PART 2

3. • Connect the third cell in parallel to the circuit as shown in Fig. (c).

• Record the reading of the voltmeter in this case (let it be E_3).

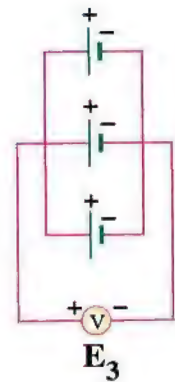


Fig. (c)

Observation :

The reading of the voltmeter (e.m.f.) is the same in each case.

Conclusion :

The e.m.f. of a group of similar dry cells which are connected in parallel is equal to the e.m.f. of one cell.

$$\therefore E_{(battery)} = E_1$$

12 Main points :

1. There are several physical properties of the electric current as : the **potential difference, current intensity** and **electric resistance**.
2. Electric current **doesn't flow** between two conductors, their electric potential are **equal**.
3. **The variable resistance (Rheostat).**

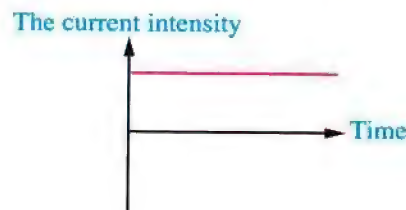
"The variable resistance" (Rheostat)

4. **The relation between the potential difference (v) and the current intensity (I) at constant temperature.**
   • Directly relationship.

5 **The relation between the current intensity (I) and the resistance (R) at constant potential difference.**

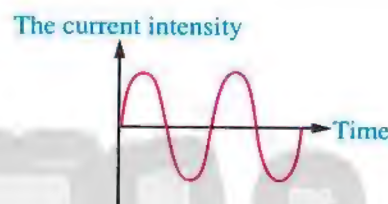
- Inversly relationship.

6 **A diagram representing direct current.**



Graphical representation of the direct current

7 **A diagram representing alternating current .**



Graphical representation of the alternating current

8 **Examples of radioactive elements :**

- Radium
- Uranium
- Cesium
- Polonium
- Rubidium
- Selenium
- Zirconium

9 **Types of radioactivity :**

- Natural radioactivity.
- Artificial radioactivity.

Alpha particle radiation

Beta particle radiation

Radioactivity phenomenon Gamma ray

10 **Sources of radiation pollution :**

- Natural radiation sources as natural radioactive elements and cosmic radiation.
- Artificial radiation sources as that are produced due to explosion of nuclear bombs or due to the nuclear reactors.

11 **Means of protection from radiation pollution :**

a. Not to be exposed to more than a dose of 5 rem in one day.
b. Workers with radioactive elements should wear protective gloves, clothes and masks.
c. Radioactive wastes must be away from underground water's path and animals that live in caves.
d. Issue laws for nuclear stations to cool the hot wastes before throwing them in seas and lakes.
e. The area chosen for storing radioactive wastes should be steady and away from animals that live in caves.

Final Revision on Unit 3

1 Definitions (or scientific terms) :

1. Hereditary traits :	They are the traits that are transmitted from one generation to another.
2. Acquired traits :	They are the traits that aren't transmitted from one generation to another.
3. Genetics :	It is a science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring.
4. Law of segregation of factors (Mendel's first law) :	When two pure individuals of any pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).
5. The principle of complete dominance :	It is the appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed, one of them carries a pure trait contrasting the trait carried by the other individual.
6. Gametes :	They are cells by which the hereditary traits are transmitted from parents to their offspring.
7. Dominant trait :	It is the trait that appears when aggregation of two similar factors (genes) of the dominant trait or one factor (gene) of the dominant trait with a factor (gene) of the recessive trait.
8. Recessive trait :	It is the trait that appears only when aggregation of two similar factors (genes) of the recessive trait.
9. Dominant gene :	It is the gene that its trait appears when it exists with a similar dominant gene or with a recessive gene for the same trait.
10. Recessive gene :	It is the gene that its trait appears only when it exists with a similar recessive gene for the same trait.
11. Pure individual :	It is the individual that carries a similar pair of genes either dominant trait or recessive trait, so the dominant trait (pure) or recessive trait appears on the individual.
12. Hybrid individual :	It is the individual that carries a different pair of genes, one is dominant trait and the other is recessive trait, so the dominant trait (impure) appears on the individual.
13. Law of independent assortment of hereditary factors (Mendel's second law) :	When two pure different individuals bearing a pair or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

14. Genes :	They are parts of DNA present on the chromosomes and they are responsible for appearing the individual's hereditary traits.
15. Chromosome :	It chemically consists of a nucleic acid called DNA combined with protein.
16. Human genome :	It is a genetic map that shows the complete set of genes present on the human chromosomes.

2 Scientists and their contributions (efforts) :

Gregor Mendel :	He is the founder of heredity.
Watson and Crick :	They make a model of DNA molecule which is composed of two strands coiled around each other forming a double helix shape.
Badel and Tatum :	They discovered the means of how the genes control the appearance of genetic traits.

3 Importance or uses :

1. Genes :	They control the appearance of hereditary traits of the living organism.
2. Genetically modified rice :	Solving the problem of malnutrition caused by deficiency of vitamin (A).
3. Human genome project :	• Determination all the human genes and identification their various functions. • Identification the genes responsible for the various diseases like cancer, diabetes, vascular diseases, mental diseases. • Determination the effect of various mutations on the function of the genes. • Understanding the human biology and identify the single differences between one person and another.

4 Important tables :

1 Some dominant and recessive traits in pea plant :

Trait	Dominant	Recessive
Stem height :	Tall	Short
Flower position :	Side	End
Flower colour :	Red	White
Pod (fruit) shape :	Swollen	Sinuous
Pod (fruit) colour :	Green	Yellow
Seed shape :	Smooth	Wrinkled
Seed colour :	Yellow	Green

PART 2

2 Some dominant and recessive traits in the human being :

Trait	Dominant	Recessive
Tongue :	The ability to roll the tongue	The inability to roll the tongue
Ear lobe :	Free ear lobe	Attached ear lobe
Nature of hair :	Curly hair	Straight hair
Colour of hair :	Black hair	Light coloured hair
Size of eyes :	Wide eyes	Narrow eyes
Colour of eyes :	Brown eyes	Coloured eyes (blue, green, grey)
Check dimples :	Dimples	No dimples
Facial freckles :	No freckles	Freckles

3 Symbols of some genetic traits in pea plant :

Trait	Symbol of the trait		
	Dominant in plants		Recessive in plants
	Pure	Hybrid	
* Stem height :	TT Tall stem	Tt	tt Short stem
* Colour of flowers :	RR Red flowers	Rr	rr White flowers
* Colour of pods :	GG Green pods	Gg	gg Yellow pods
* Colour of seeds :	YY Yellow seeds	Yy	yy Green seeds
* Shape of seeds :	SS Smooth seeds	Ss	ss Wrinkled seeds

5 Important laws and solved problems :

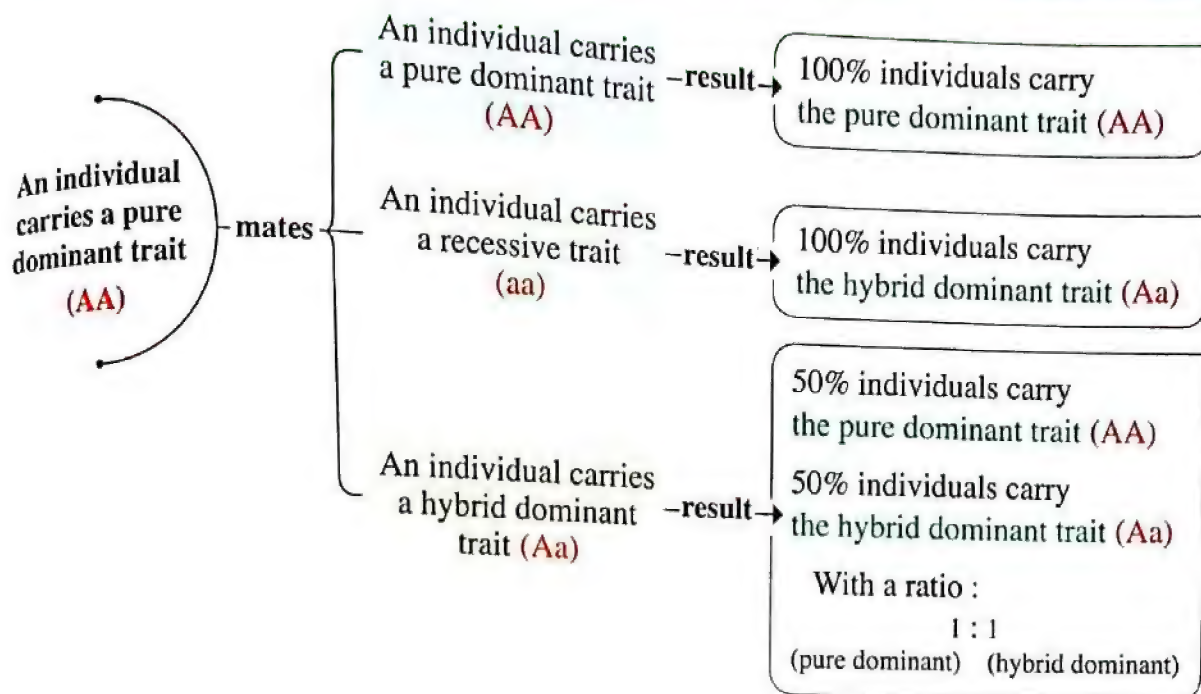
1 Mendel's first law (law of segregation of factors) :

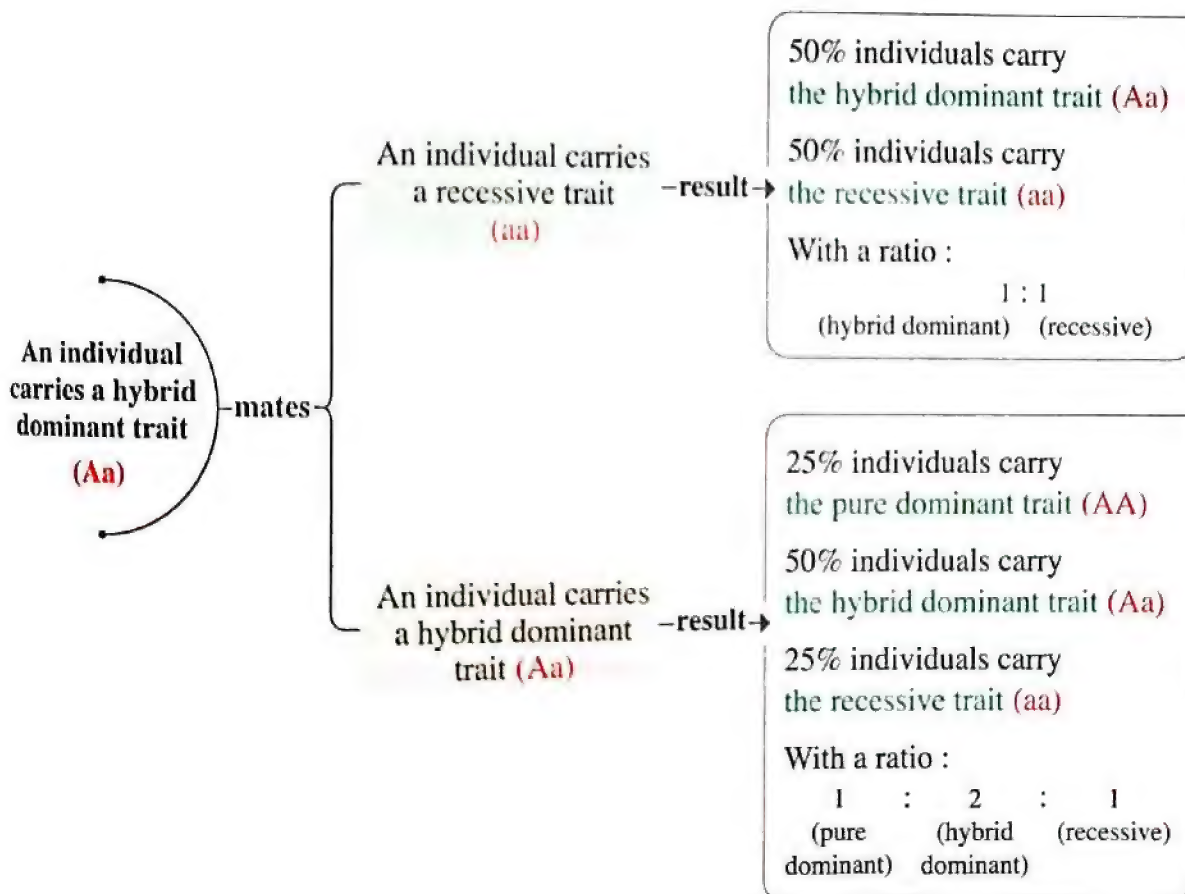
When two individuals of any pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

Problems

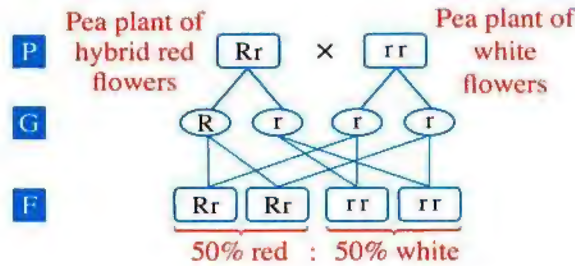
Problem 1 *If crossing takes place between two pea plants, one of them of hybrid red flowers and the other of white flowers. Explain on the bases of genetic principles, the results of such crossing. Mention the ratio of the obtained offspring.*

5 Summary that shows the results of mating between different individuals :



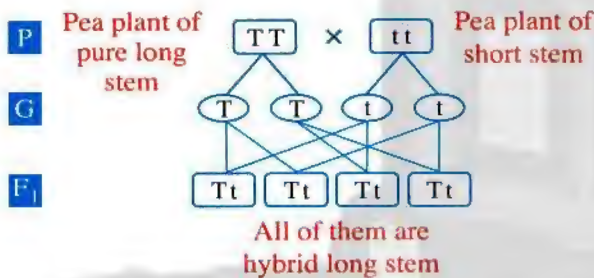


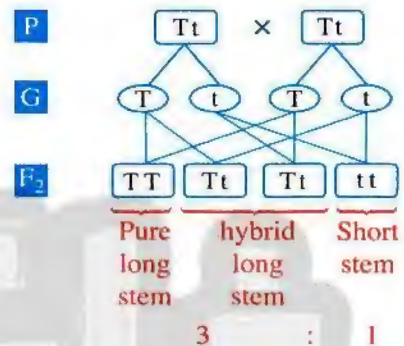
Solution



Problem 2 *Using symbols to express the results of mating between a short stem pea plant (tt) and pure long stem pea plant (TT).*

Solution





Problem 3 *If you know that the dominant colour of the pea plant fruit is the green colour (G) and the recessive colour of the pea plant fruit is yellow colour (g).*

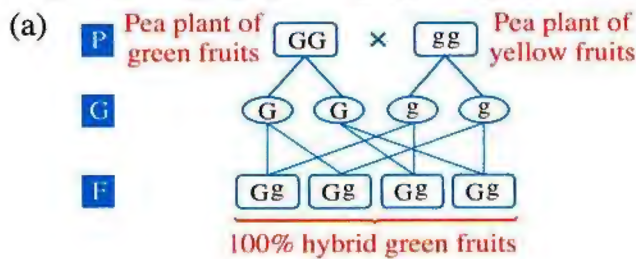
(a) Mention on genetic bases the results of this crossing.

(b) - What are the results of crossing an individual resulted from the previous crossing and a plant with yellow fruits ?

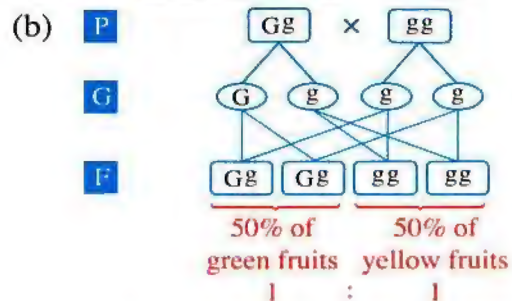
- Mention the ratio of offspring.

Solution

(a)



(b)



2 Mendel's second law (law of independent assortment of hereditary factors) :

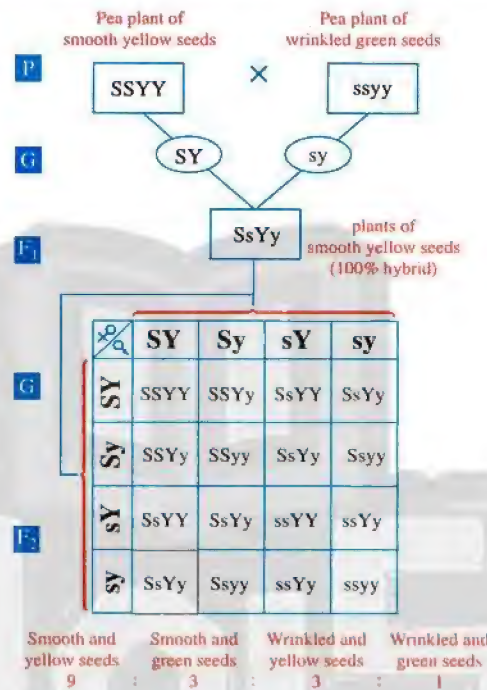
When two pure different individuals bearing a pair or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

PART 2

Problems

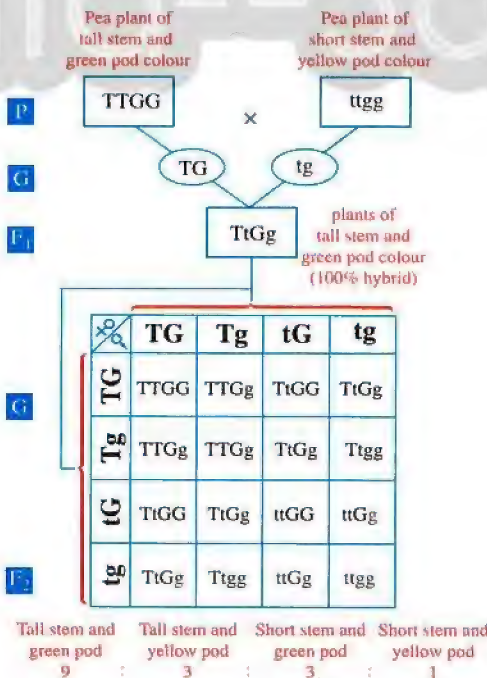
Problem 1 *If crossing takes place between two pea plants, one of them of smooth yellow seeds (SSYY) and the other of wrinkled green seeds (ssyy). Explain on genetic principles the genetic structure for the first and second generations.*

Solution



Problem 2 *Using symbols to express the results produced from crossing between a pea plant of tall stem & green pod colour (TTGG) and another one of short stem & yellow pod colour (ttgg). [Illustrating : Parents - Gametes - First generation - Second generation in each crossing].*

Solution



6 Give reasons for :

1. **Learn to walk in children is not considered a genetic trait.**
Because it's acquired trait that can't be transmitted from a generation to another.
2. **The skill of playing basketball isn't hereditary trait.**
Because it's acquired trait that can't be transmitted from a generation to another.
3. **Mendel is considered as the founder of heredity.**
Because the scientific studies of heredity started with Mendel's experiments on pea plant and according to the results reached by Mendel, heredity scientists have gathered a lot of information about how the hereditary traits are transmitted from one generation to another.
4. **Mendel selected the pea plant to conduct his experiments.**
Due to :
- It is easy to be planted and it grows fast.
- Its life cycle is short.
- Its flowers are hermaphrodite, so it can be self-pollinated.
- It can easily be artificially pollinated (human intervention).
- It produces large numbers of plants in a generation.
- It has several pairs of easily recognized contrasting traits.
5. **Mendel removed the stamens of pea plant flowers before the anther becomes mature.**
To insure that the plant doesn't be self-pollinated.
6. **Mendel covered the stigmas of the pistils of pea flowers during studying the hereditary traits.**
To prevent cross pollination with other flowers.
7. **Mendel let the pea plants self-pollinate for several generations.**
To be sure of the purity of the trait.
8. **Mendel's first law is known as the law of segregation of factors.**
To segregate the two factors of hereditary trait from each other when formation of gametes.
9. **The disappearance of the green colour of the seeds in the first generation, by crossing of the two pea plants, one pure green seeds and the other of pure yellow seeds.**
Because the green colour trait of seeds is a recessive trait that disappears in all individuals of the first generation which carry the dominant trait at a ratio of 100 % according to Mendel's first law.
10. **When a pure yellow pod pea plant is pollinated with a pure green pod pea plant, they produce plants all are green pods.**
Because the green pod trait dominates over the yellow pod trait in the pea plant according to the principle of complete dominance.
11. **When you pollinate a pure tall stem pea plant with a short stem pea plant, they produce plants all are tall stems.**
Because the tall stem trait dominates over the short stem trait according to the principle of complete dominance.

12. **The recessive trait is always pure.**
Because it doesn't appear unless the two genes of recessive trait aggregate.
13. **Some traits appear on offspring, but do not appear on their parents.**
Because there are recessive traits that do not appear in parents but they appear in the offspring when the two genes of these traits aggregate together.
14. **The curly hair trait dominates over the smooth hair trait.**
Because the gene of curly hair dominates over the gene of smooth hair when they aggregate together.
15. **If one individual inherited from one of his parents the gene that carries the curly hair trait, so this individual will be with curly hair.**
Because the gene of curly hair is a dominant gene, its trait appears if it exists with another similar dominant gene (curly hair) or with a recessive gene (straight hair).
16. **The ability of rolling the tongue is dominant trait in the human being.**
Because the gene of the ability to roll the tongue dominates over the gene of the non-ability to roll the tongue if they are both present together in an individual.
17. **The free ear lobe is dominant over the attached ear lobe.**
Because the gene of the free ear lobe dominates over the gene of the attached ear lobe if they are both present together in an individual.
18. **The wide eyes trait dominates over the narrow eyes trait in human.**
Because the gene of wide eyes dominates over the gene of narrow eyes if they are both present together in an individual.
19. **It is possible for two parents have free ear lobe produce offspring have attached ear lobe.**
Because both parents are hybrid, so the dominant trait (free ear lobe) appears on them, but when the two factors of recessive trait (attached ear lobe) aggregate from each of them, this trait appears in offspring.
20. **DNA is the source of the genetic information of the living organism.**
Because DNA consists of genes which are responsible for appearance of the genetic traits of the living organism.
21. **The enzymes play an important role in the appearance of the hereditary traits.**
Because every gene gives a special enzyme which is responsible for the occurrence of a chemical reaction resulting in a protein shows a specific hereditary trait.
22. **About 500.000 people every year are affected by losing their sight in developing countries.**
As a result of malnutrition which is produced from deficiency in vitamin (A).
23. **Scientists are interested in creating genetically modified rice.**
Because the normal rice doesn't contain carotene substance which changes inside the body into vitamin (A), which its deficiency in the body leads to losing the sight.
24. **Some people who depend on eating rice have deficiency in vitamin (A).**
Because rice doesn't contain pro-vitamin (A) known as carotene which is converted into vitamin (A) inside the body.

7 What would happen when ... ?

1. **The stigmas of the flowers of pea plant uncovered during the study of the inherited traits.**
   Cross pollination occurs in these flowers.
2. **Mendel didn't remove the stamens of the flowers of pea plant that produces yellow seeds.**
   Self pollination occurs in these flowers.
3. **Mating between two individuals, where one of them carries pure dominant trait, but the other carries pure recessive trait.**
   They produce a generation carries the hybrid dominant trait only.
4. **• Mating between two pure individuals different in a pair or more of contrasting traits.**
   • Two pure individuals bearing two pairs of contrasting traits are crossed.
   The trait of each pair is inherited independently and all individuals of the first generation appear carrying the dominant traits only and in the second generation, the dominant trait and the recessive trait appear at a ratio of 3 : 1
5. **A dominant gene for one of the traits is present with another for the same characteristic.**
   The dominant trait appears.
6. **A pea plant of short stem is pollinated by another of hybrid tall stem.**
   The result of the produced generation is 50% hybrid dominant trait : 50% pure recessive trait.
7. **Pollination of peas flowers of hybrid yellow seeds with each other.**
   They produce a generation of yellow seeds and green seeds at a ratio of 3 : 1 respectively.
8. **There is a mating between two individuals resulting in producing 50% dominant individuals and 50% recessive individuals.**
   The dominant individuals are hybrid.
9. **A dominant gene exists with a recessive one.**
   The dominant gene prevents the appearance of the effect of the other gene.
10. **Cross-pollination takes place between two pure pea plants, one with yellow pods and the other with green pods.**
    They produce pea plants, all of them are hybrid green pods.
11. **Mating between a pure pea plant having tall stem and red flowers and another having short stem and white flowers (according to the appearance of traits in the second generation).**
    They produce pea plants at a ratio of 9 (tall stem & red flowers) : 3 (tall stem & white flowers) : 3 (shorts stem & red flowers) : 1 (short stem & white flowers).
12. **Mating between two individuals each of them has pure trait of the ability to roll the tongue.**
    They produce individuals carry the ability to roll the tongue trait.

PART 2

13. • **The gene cannot produce its specific enzyme.**
• **Gene failed to produce its own enzyme.**
The reaction which results in a protein showing a specific hereditary trait will not occur.

14. **Dependence on rice as a main food.**
Deficiency in vitamin (A) inside the body which may lead to loss of sight.

8 Comparisons :

1. The hereditary traits and the acquired traits :

The hereditary traits	The acquired traits
They are the traits that are transmitted from one generation to another. *Ex. :* • Hair colour. • Skin colour. • Number of fingers. • The blood groups.	They are the traits that aren't transmitted from one generation to another. *Ex. :* • Skill of playing football. • Learning of swimming. • Speaking in many languages. • Learning of walking in children.

2. The dominant trait and the recessive trait :

Points of comparison	The dominant trait	The recessive trait
Definition :	It is the trait that appears when aggregation of two similar genes of the dominant trait or one gene of the dominant trait with a gene of recessive trait.	It is the trait that appears only when aggregation of two similar genes of recessive trait.
Example :	The trait of yellow colour seeds of pea plant.	The trait of green colour seeds of pea plant.
The ratio of its appearance according to Mendel's first law :	It appears at a ratio of 100% in the first generation and at a ratio of 75% in the second generation.	It disappears in the first generation and appears at a ratio of 25% in the second generation.
Purity of the trait :	It is pure or impure.	It is always pure.

3. The pure individual and the hybrid individual :

The pure individual	The hybrid individual
It is the individual that carries a similar pair of factors, either dominant or recessive, so the dominant trait (pure) or recessive trait appears on the individual.	It is the individual that carries a different pair of factors, one is dominant and the other is recessive, so the dominant trait (impure) appears on the individual.

9 Main points :

1 Mendel's assumptions (hypotheses) to explain the results of its experiments.

1. The hereditary traits are transmitted from the parents to the offspring by hereditary factors carried by **Gametes**.
2. Every hereditary trait is controlled by two hereditary factors, one from the father and the other from the mother.
3. The two hereditary factors of each trait are separated when the gametes are formed, where each gamete carries only one factor from these two factors.
4. During fertilization process, the two hereditary factors aggregate again. If the two factors are :
   - Similar **(or homozygous)**, so the produced trait (dominant or recessive) is pure and the individual that carries this trait is called **pure individual**.

Dominant factor	+	Dominant factor	→	Pure dominant trait
Recessive factor	+	Recessive factor	→	Pure recessive trait

   - **Different (or heterozygous)**, so the produced trait (dominant) is impure and the individual that carries this trait is called **Hybrid individual**.

Dominant factor	+	Recessive factor	→	Impure dominant trait

2 Composition of nucleic acid DNA

3 How do the genes perform their functions ?
Or
Explain the mechanism of action of the gene.

4 Science, technology and society :

*** The resultants of the human genome project :**

- The project showed human similarity in more than 99% from the sequence of nucleotides of DNA, despite the small percentage of the differences, but they affect to a great extent the acceptance of the individual to the harmful environmental effects like bacteria, viruses, poisons, chemicals, medicines and various treatments.

Final Revision on Unit 4

1 Definitions (or scientific terms) :

1. Hormone :	It is a chemical substance (or a chemical message) that controls and organizes most of the vital activities and functions in the bodies of living organisms.
2. Endocrine glands :	They are ductless glands that secrete their hormones directly in blood without passing through ducts.
3. Target cells :	They are the cells that the hormones affect and they are almost located away from the endocrine gland that secretes the hormone.
4. Hormone disorder :	It is the increase or decrease in the secretion of one of the hormones as a result of a disorder in the action of the endocrine gland responsible for it abnormally.
5. Dwarfism :	The body stops growing, so the person becomes a dwarf as a result of decreasing the secretion of the growth hormone at childhood.
6. Gigantism :	A continuous growth in the limb's bones, so the person becomes a giant as a result of increasing the secretion of the growth hormone at childhood.
7. Diabetes :	A disease caused due to the decrease in the secretion of the insulin hormone, which leads to increasing the level of glucose sugar in blood and its existence with the urine.
8. Exophthalmic goiter :	A disease causes an enlargement of thyroid gland accompanied by loss of weight, tension and exophthalmoses as a result of increasing the secretion of thyroxin hormone.
9. Simple goiter :	A disease causes an enlargement of thyroid gland and the neck as a result of decreasing the secretion of thyroxin hormone.

2 Importance :

1. Hormones :	They control and organize most of the vital activities and functions in the bodies of living organisms.
2. Endocrine glands :	They secrete the hormones in the human body.
3. Pituitary gland :	It secretes hormones that regulate the activities of most of other endocrine glands, so it is called the master gland or the main gland.

4. Growth hormone :	– It controls the speed of growth rate of body muscles, bones and other organs. – It determines the height that the person will reach when becomes a fully grown.
5. Mammary glands activating hormones :	They activate the mammary glands to secrete milk during breast feeding process.
6. Thyroid stimulating hormone :	It stimulates thyroid gland to secrete its hormones.
7. Activating hormones of sexual glands :	• Regulates the growth and the development of sex organs. • Activates the sexual glands to secrete their hormones near to adulthood stage.
8. Thyroid gland :	It secretes thyroxin hormone and calcitonin hormone.
9. Thyroxin hormone :	It plays a main role in food assimilation processes in the body, where it liberates the energy necessary for the human body from food.
10. Iodine salt :	It is rich in iodine element that enters in thyroxin hormone's structure.
11. Calcitonin hormone :	It controls the level of calcium in blood.
12. Adrenalin hormone :	It stimulates body's organs to respond to emergencies.
13. Pancreas gland :	It secretes digestive juices that help in digestion process and it also secretes insulin and glucagon hormones which regulate blood sugar level in blood.
14. Insulin hormone :	It stimulates the storage of glucose sugar in the liver.
15. Glucagon hormone :	It stimulates the release of glucose sugar from the liver.
16. Estrogen hormone :	It appears the female secondary sex characters.
17. Progesterone hormone :	It promotes the growth of endometrium (the lining of uterus).
18. Testosterone hormone :	It appears the male secondary sex characters.

3 Give reasons for :

1. Endocrine glands are called by this name.
Because they secrete their hormones directly in blood without passing through ducts.

2. Blood stream is the only way for hormones to reach their sites of action.
Because the target cells that are affected by hormone are located faraway from endocrine glands, so blood is the only way for the hormones to reach them.

3. Pituitary gland is called the master gland.
Because it secretes hormones that regulate the activities of most of other endocrine glands.

PART 2

4. **The pituitary gland plays an important role in delivery and breast feeding processes.**
Because it secretes the facilitating hormone during delivery and the mammary glands activating hormone to activate the mammary glands to secrete milk during breast feeding process.

5. • **The height of some persons may exceed 2 metres.**
• **The limb's bones of some people grow continuously, so they become giants.**
Due to the increase in the secretion of the growth hormone at childhood.

6. • **The height of some persons may reach less than half metre.**
• **The stopping of the body growth, so the person becomes a dwarf.**
Due to the decrease in the secretion of the growth hormone at childhood.

7. • **Iodine salt is preferred than the normal salt.**
• **The food must be contained iodine.**
Because iodine salt is rich in iodine element that enters in the thyroxin hormone's structure.

8. **Some persons have enlarged thyroid gland.**
Due to decrease or increase in the secretion of thyroxin hormone.

9. **Man suffers from simple goiter disease when his food lacks iodine.**
Due to the decrease in the secretion of thyroxin hormone as a result of the lack of iodine from food as it enters in the hormone's structure.

10. **Thyroid gland plays an important role in controlling the level of calcium in the blood.**
Because it secretes calcitonin hormone which controls the level of calcium in the blood.

11. **The two adrenal glands have an important role when man is exposed to emergency.**
Because they secrete the adrenalin hormone that stimulates the human body's organs to respond to emergencies.

12. **Pancreas is a mixed gland.**
Because the pancreas acts as a ductless gland which secretes the insulin and glucagon hormones that regulate the glucose sugar level in blood and it also secretes digestive juices that help in digestion process through a duct.

13. **Pancreas is a double function gland.**
Because the pancreas secretes the insulin hormone and the glucagon hormone and the function of each hormone contradicts the function of the other hormone.

14. **Diabetes disease is treated with insulin hormone.**
Because it reduces the percentage of glucose sugar in blood.

4 What would happen ... ?

1. **When the glands that secrete hormones have ducts.**
   The blood will not be the only way for the hormones to reach their sites of action.
2. **When the deficiency of growth hormone secretion at childhood.**
   The body stops growing, so the person becomes a dwarf.
3. **If the secretion of growth hormone is increased at childhood.**
   A continuous growth in the limb's bones, so the person becomes a giant.
4. **To the human when thyroxin hormone secretion increases.**
   The human will suffer from exophthalmic goiter.
5. **When the deficiency of thyroxin hormone secretion.**
   The human will suffer from simple goiter.
6. **When man takes a little amount of iodine in his food.**
   This leads to decreasing in secretion of thyroxin hormone and this leads to that the human suffers from simple goiter.
7. **When man is exposed to emergency.**
   Pituitary gland responds by secretion of adrenal glands activating hormone, so these adrenal glands secrete adrenalin hormone which stimulates body's organs to respond to emergencies.
8. **To blood sugar level when pancreas does not secrete glucagon hormone.**
   The level of glucose sugar in blood decreases.
9. **If the pancreas decreases its secretion of the insulin hormone.**
   The level of glucose sugar in blood increases or human will suffer from diabetes disease.
10. **If the pancreas decreases its secretion of the glucagon hormone.**
    The level of glucose sugar in blood decreases.
11. **When glucose sugar level is decreased in blood.**
    Pancreas responses by secreting glucagon hormone to raise the percentage of glucose sugar in blood.
12. **When glucose sugar level is increased in blood.**
    Pancreas responses by secreting insulin hormone to reduce the percentage of glucose sugar in blood.
13. **When testosterone hormone does not secreted at adulthood stage in a male.**
    The male secondary sex characters will not be appeared.
14. **When estrogen hormone doesn't secreted at adulthood stage in a female.**
    The female secondary sex characters will not be appeared.

PART 2

5 Comparisons :

1 Pituitary gland and thyroid gland :

Points of comparison	Pituitary gland	Thyroid gland
Location :	It is located below the brain.	It is located in the front surface of the neck on both sides of the trachea.
Description :	It is a small gland in the size of a pea seed and it consists of two lobes.	It consists of two lobes, linked together by a small part.
Function :	It secretes hormones that regulate the activities of most of other endocrine glands.	It secretes thyroxin hormone which plays an important role in food assimilation processes in the body, and calcitonin hormone which controls the level of calcium in the blood.

2 Dwarfism and gigantism :

Points of comparison	Dwarfism	Gigantism
Reason :	Decrease in secretion of the growth hormone at the childhood.	Increase in secretion of the growth hormone at the childhood.
Feature of disorder :	The body stops growing, so the person becomes a dwarf.	A continuous growth in the limbs' bones, so the person becomes a giant.

3 Simple goiter and exophthalmic goiter :

Points of comparison	Simple goiter	Exophthalmic goiter
Reason :	Decrease in secretion of the thyroxin hormone due to the lack of iodine from food as it enters in the hormone's structure.	Increase in secretion of the thyroxin hormone with large amounts.
Symptoms of the disease :	Enlargement of thyroid gland and the neck.	Enlargement of thyroid gland accompanied by lose of weight, tension and exophthalmoses.

4 Insulin hormone and glucagon hormone :

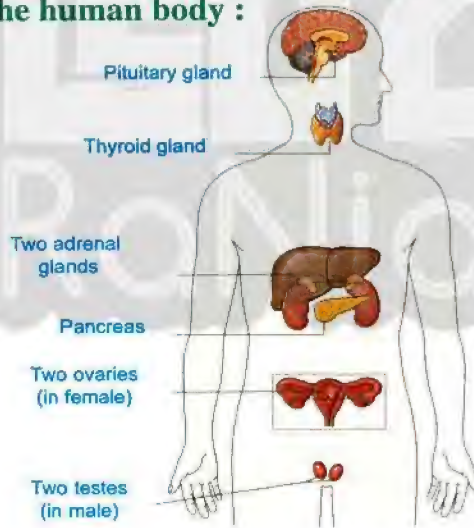
Points of comparison	Insulin hormone	Glucagon hormone
Reason for secretion :	It secretes when the level of glucose sugar increases in the blood.	It secretes when the level of glucose sugar gets lower than its normal level in the blood.
Function :	It stimulates the storage of glucose sugar in liver.	It stimulates the release of glucose sugar from the liver.

5 Testes and ovaries :

Points of comparison	Testes	Ovaries
The produced hormones :	Testosterone hormone.	Estrogen and progesterone hormones.
The function :	It appears the male secondary sex characters.	- Estrogen appears the female secondary sex characters. - Progesterone promotes the growth of endometrium (the lining of uterus).

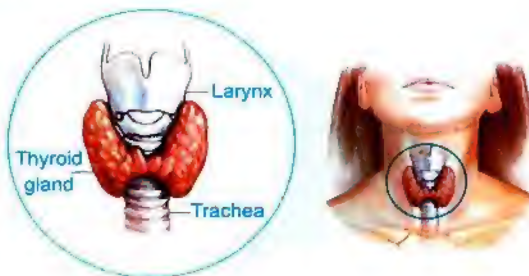
6 Important drawings :

1 The most important endocrine glands in the human body :

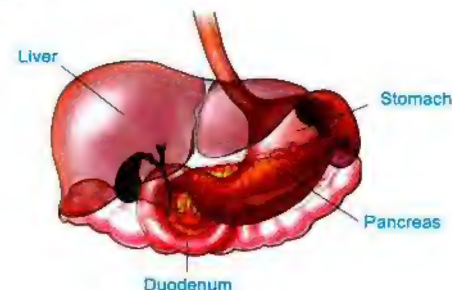


2 Pituitary gland :

3 Thyroid gland :



4 Pancreas :



PART 3 Final Examinations

Important note :

There is an additional question at the end of the examinations on the parts which are canceled from the syllabus of the previous year.

Final Examinations 2018

1 Cairo Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The instrument which is used to measure the electric potential difference is ....
2. The chromosome is chemically consisted of a nucleic acid called DNA binds with the ....
3. Sodium metal reacts with water producing sodium hydroxide and .... gas evolves.
4. The scientist Mendel named the trait that appears in all individuals of the first generation as the .... trait, while the other (contrasting) trait that disappears in the individuals of the first generation as the .... trait.

B Define each of the following :

1. The chemical activity series.
2. The radioactivity phenomenon.
3. The electric current.

C Calculate the electric current intensity due to the flow of quantity of electricity of 6000 coulomb through a cross-section of a conductor for 5 minutes.

Question 2

A Choose the correct answer :

1. From the dominant traits in the human being is the .... trait.
   a. straight hair b. wide eyes
   c. absence of dimples in the face d. presence of freckles in the face
2. According to Mendel's second law, each pair of the alternative traits is inherited independently of the others and appears in the second generation at a ratio of ....
   a. 1 : 1 b. 2 : 1 c. 3 : 1 d. 4 : 1
3. The sliding rheostat is used to .... in the electric circuit.
   a. measure the resistance b. measure the potential difference
   c. measure the current intensity d. change the resistance
4. Carbon dioxide evolves during thermal decomposition of .... compound.
   a. HgO b. $CuSO_4$ c. $CuCO_3$ d. $Cu(OH)_2$

PART 3

5. The ratio between the potential difference across two ends of a conductor and the electric current intensity passing through it is equal to ....
   a. e.m.f.
   b. electric current.
   c. quantity of electricity.
   d. electric resistance.

B A battery consists of three electric cells, the e.m.f. of each cell is 3 volt. Calculate the e.m.f. when the cells are connected :

1. In series.
2. In parallel.

(Write the law used in each case)

C What would happen when .... ?

1. The human body exposed to a large dosage of radiation for a short time.
2. Heating of sodium nitrate.
3. Adding silver nitrate solution to sodium chloride solution.

Question 3

A Write the scientific term for each of the following :

1. The change in the concentration of the reactants and products at a unit time.
2. Reaction between an acid and an alkali forming salt and water.
3. The substance which gains an electron or more during a chemical reaction.
4. The breaking up of bonds in reactants molecules and formation of new bonds in the products molecules.
5. A reaction where double substitution occurs between the ions of two compounds to form two other new compounds.
6. The charges transmitted by a current intensity with one ampere in one second.

B Compare between :

1. The direct electric current and the alternating electric current. (Concerning : the intensity & direction)
2. Oxidation and reduction. (Concerning : the definition)

Question 4

A Rewrite the following statements after correcting the underlined words :

1. Mendel's first law is called the law of **independent assortment of hereditary factors**.
2. Nitrogen pentoxide breaks up into nitrogen dioxide gas and **nitrogen** gas.
3. The reaction of ionic compounds is **slower** than that of covalent compounds.
4. The scientist Mendel has found out that the hereditary traits are transmitted from the parents to the offspring by means of hereditary factors, they are now called the **enzymes**.
5. In electric generator (dynamo), the **heat** energy converts to electric energy.

B **Give reasons for the following :**

1. Occurrence of reaction between magnesium and copper sulphate solution.
2. The scientist Mendel chooses the pea plant to conduct his researches.

C **Explain on genetic bases :**

The genetic composition of the parents and offspring produced from crossing a pea plant with pure dominant yellow seeds with another with recessive green seeds.
(Y dominant – y recessive)

Additional questions

A **Choose the correct answer :**

1. The ceramic cells in the catalytic converter leads to ....
   a. increasing the surface area exposed to the reaction.
   b. increasing the concentration of the reactants.
   c. increasing the temperature.
   d. no correct answer.
2. All of the following are considered from endocrine glands except .... gland.
   a. pituitary b. thyroid c. adrenal d. sweat

B **Give a reason for :**

Endocrine glands are called ductless glands.

2 Giza Governorate

Answer the following questions :

Question 1

A **Complete the following sentences :**

1. $Na_2CO_3 + \text{..........} \longrightarrow 2NaCl + H_2O + CO_2$
2. One of the properties of the direct current is that ....
3. Every hereditary trait is controlled by two hereditary factors which separate during formation of the ....
4. The gene controls the appearance of a hereditary trait of the living organism by giving .... which is responsible for the occurrence of a chemical reaction resulting in a protein.

B **Compare between :**

1. Oxidation and reduction (concerning : the definition).
2. Genetic effects and cellular effects of radiation.

C **What is meant by ..... ?** Resistance of a conductor is 25 ohm.

PART 3

Question 2

A Choose the right answer :

1. Double substitution reactions between salt solutions are accompanied by formation of ....
   a. a metal. b. a precipitate. c. an oxide. d. a non-metal.
2. The nuclear energy is peacefully used in the industrial field to convert sand to .... for manufacturing computer processors.
   a. electric energy b. silicon sheets c. nuclear fuel d. atomic bombs
3. The scientists .... discovered the means of how the gene controls the appearance of the hereditary trait.
   a. Mendel and Newton b. Watson and Crick
   c. Johansen & Mendel d. Badel and Tatum
4. Mendel's second law is known as the law of .... of factors.
   a. independent assortment b. segregation c. merging d. disappearance

B Give reasons for the following :

1. Mendel chose pea plant to make his experiments.
2. Some electric circuits contain variable resistance.

C Calculate the work done to transfer an electric charge of 20 coulomb through a conductor, if the potential difference between its ends is 50 volt.

Question 3

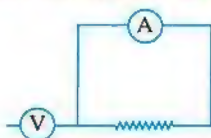
A Write the scientific term for each of the following :

1. The catalyst that is used to slow down a chemical reaction.
2. The quantity of electricity (electric charge) flowing through a cross-section of a conductor in one second.
3. The individual that carries similar pair of hereditary factors either dominant or recessive.
4. The arrangement of metals in a descending order according to their chemical activity.

B What happens when ... ?

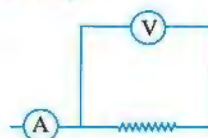
1. Replacing dilute hydrochloric acid by concentrated hydrochloric acid when reacting with magnesium.
2. Two pure individuals bearing two pairs of contrasting traits are crossed.

C Which one of the following figures represents a part of an electric circuit that contains an ammeter and a voltmeter connected in right way ?

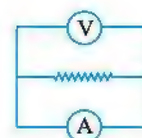


(a)

(b)



(c)



(d)

Question 4

A Correct the underlined parts in the following :

1. Mendel chose **eleven** main traits of pea plant to conduct his experiments.
2. When adding magnesium pieces to copper sulphate solution, a **black** precipitate is formed.
3. The electromotive force of three identical cells connected in parallel is **twice** the electromotive force of one cell.
4. $2Na + 2H_2O \longrightarrow 2NaOH + \mathbf{O_2} \uparrow + heat$

B What is meant by ... ?

1. Hereditary traits.
2. Thermal decomposition reactions.

C In the opposite figure :

How is the rate of this reaction measured ?

Additional questions

Choose the correct answer :

1. Pituitary gland is called the .... gland.
   a. activity b. master c. main d. (b) or (c)
2. The hormone which determines the height that the person will reach at adulthood stage is .... hormone.
   a. thyroxin b. insulin c. testosterone d. growth
3. The hormone which regulates the level of calcium in blood is the .... hormone.
   a. calcitonin b. thyroxin c. progesterone d. adrenalin

3 Alexandria Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The measuring unit of the absorbed radiation is ....
2. The ability to roll the tongue is one of the .... traits in the human being.
3. The rate of decomposition of hydrogen peroxide increases by adding .... or a piece of ....

PART 3

B **If you have copper sulphate solution, pieces of magnesium, sodium nitrate, test tubes and a flame. Show by balanced symbolic equations how to get :**

1. Copper metal.
2. Oxygen gas.

C **Mention two properties of the catalyst.**

Question 2

A **Write the scientific term for the following :**

1. The change in the concentration of the reactants and resultants at a unit time.
2. It is the state of an electric conductor that shows the transfer of the electricity from or to it when it is connected to another conductor.
3. The traits that are transferred from a generation to another such as blood group.

B **If you have a voltmeter, an ammeter, a switch, a fixed resistance, a rheostat, connecting wires and three electric cells connected in series :**

1. Draw an electric circuit to illustrate the relation between the current intensity and the potential difference.
2. If you know that the e.m.f. of each cell in the previous circuit is 2 volt, find the value of the fixed resistance if the reading of the ammeter was 6 ampere.

C **Mention one of the peaceful uses of nuclear energy.**

Question 3

A **What is the reducing agent in the following two reactions ? (mention the reason)**

1. $CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$
2. $2Na + Cl_2 \longrightarrow 2NaCl$

B **Correct the underlined parts in the following :**

1. Genes are parts of DNA found in the **cytoplasm** of the cell.
2. In the circuit of the direct current, **molecules** flow from one of the two poles to the other in the electrochemical cell.

C **Mention the law of segregation of factors of Mendel.**

Question 4

A **Choose the right answer :**

1. All of the following are radioactive elements except ....
   a. radium. b. uranium. c. iron. d. cesium.
2. On adding silver nitrate solution to sodium chloride solution, ... is formed.
   a. a white precipitate of sodium nitrate
   b. a white precipitate of silver chloride
   c. a blue precipitate of silver chloride
   d. no precipitate

3. The measuring unit of the quantity of electricity is ....
a. ampere. b. coulomb. c. volt. d. joule.

4. For measuring the electric resistance, ... device is used.
a. ohmmeter b. ammeter c. voltmeter d. sliding rheostat

B Give reasons for :

1. The rate of the reaction of hydrochloric acid with the iron filings is faster than that with a piece of iron of the same mass.
2. Mendel selected the pea plant to conduct his experiments.

C Explain on crossing between a plant of green seeds (recessive trait) with another of yellow seeds (dominant trait), the produced plants with green seeds.

Additional questions

A Complete :

1. The most modern cars are equipped with .... which helps in treatment of harmful gases emitted from the car engine.
2. Below the brain, there is a small gland called .... , and inspite of its small size it is called .... or ....

B Put (✓) or (×) in front of the following sentences :

1. Sodium carbonate is used in polishing silver. ( )
2. The calcitonin hormone controls the level of calcium in the human body. ( )

4 El-Kalyoubia Governorate

Answer the following questions :

Question 1

A Write the scientific term of the following sentences :

1. Its chemical structure is DNA with protein.
2. The potential difference between two poles of the electric source when the electric circuit is opened.
3. The material which increases the speed of reaction without being changed.
4. The quantity of charge transferred by a fixed current 1 ampere per a second.
5. The genetic map of genes in human chromosomes.

PART 3

B The following figures show two graphs for two different types of an electric current :

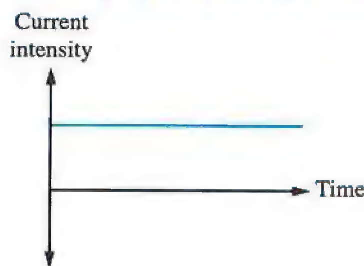


Figure (1)

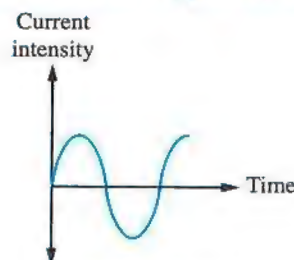


Figure (2)

1. Which of the two graphs expresses the current which is able to transmit for long distances ?
2. Mention the type of the current you choose and the source from which it is produced.

C Give reasons for :

1. The ability to wrap (roll) the tongue is from the dominant characteristics in human.
2. A variable resistor (sliding rheostat) is connected in the electric circuit.
3. Copper does not react with hydrochloric acid (HCl), whereas zinc reacts with hydrochloric acid (HCl).

Question 2

A Choose the correct answer :

1. Genes control the organism's genetic characteristics by producing ....
   a. hormones. b. enzymes. c. fats. d. vitamins.
2. The unit of measuring the absorbed radiation is ....
   a. joule. b. coulomb. c. rem. d. newton.
3. If vaccination occurs between two individuals, both of them are hybrid and 200 members resulted from this vaccination, then the hybrid members produced may be .... individual.
   a. 50 b. 100 c. 150 d. 200
4. The reaction $2Cl^- \longrightarrow Cl_2 + 2e^-$ represents .... process.
   a. oxidation b. reduction c. association d. substituting
5. When hydrochloric acid reacts with sodium carbonate, then the reaction produces gas which ....
   a. turbids limewater. b. burns with pop sound.
   c. increases ignition. d. its colour is red brown.

B There are three identical electric cells whose e.m.f. = 6 volt are connected in the electric circuit by a certain method and the total resistance = 4 ohm (Ω). Show by drawing and solving how the circuit is connected to obtain a current = 1.5 ampere.

C The hybridization in the Drosophila between a male and a female, both of them are long wings and the product is 27 members with long wings and 9 members with short wings. Explain that on genetic bases (If the symbol of long wing is T and short wing is t).

Question 3

A Put (✓) or (×) in front of the following sentences :

1. A member which gains one gene for freckles in the face becomes without this feature. ( )
2. The chemical reaction is a process of breaking up of bonds between molecules of reactants and formation of new bonds in products molecules. ( )
3. The hybrid individual carries a gene for the dominant characteristic and another one for the recessive characteristic. ( )
4. Reaction of iron filings (powder) with sulphuric acid H_2SO_4 becomes slower than the reaction of block of iron with the same acid. ( )
5. Radium is one of the natural radioactive elements. ( )

B Show by using balanced chemical equations the effect of heat on the following compounds :

1. Copper hydroxide.
2. Mercuric oxide.

C If the work done = 1000 Joule needed to transfer a quantity of electricity = 100 coulomb in a conductor during 20 second. Find :

1. The current intensity passing in the conductor.
2. The resistance of a conductor.

Question 4

A What happens ... ?

1. When the dominant gene exists with another for the same characteristic.
2. To the number of collisions when the temperature of the reaction is raised up.
3. When manganese dioxide (MnO_2) is added in a test tube that contains hydrogen peroxide.
4. If there is a mating between two individuals resulting in producing 50% dominant individuals and 50% recessive individuals.
5. When the potential difference increases between two ends of a conductor with a fixed resistance in the closed circuit.

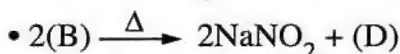
B 1. Under what conditions do the elements become naturally radioactive ?

2. Compare between controlled industrial radioactive and uncontrolled industrial radioactive (in terms of their uses).

PART 3

C From the two chemical reactions, answer the following questions :

• (A) + $AgNO_3$ ⟶ Precipitate + (B)


• 2(B) $\xrightarrow{\Delta}$ $2NaNO_2$ + (D)

1. Write the chemical formula of (A) and (B).
2. What is the name of gas (D) and how do you discover it ?
3. Write the chemical formula of the precipitate and its colour.

Additional questions

A Put (✓) or (×) in front of the following sentences :

1. Dwarfism is the continual growth of human limbs, so the person becomes a giant. ( )
2. Sodium carbonate is used in polishing silver. ( )

B Write the scientific term for each of the following statements :

1. A metallic can exists in most modern cars to treat the harmful gases emitted from the engine.
2. They are considered one of the most important safety means in cars at emergencies.

5 El-Sharkia Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. $2N_2O_5$ ⟶ .... + O_2
2. The .... is considered a part of DNA which consists of smaller structural units called ....
3. Iron rust is a .... chemical reaction, while a firework is a .... chemical reaction.

B What is meant by each of the following ..... ?

1. Ohm's law.
2. The rate of chemical reaction.
3. The law of independent assortment of the hereditary factors.

C Calculate the current intensity due to the flow of 5400 coulomb through across-section of a conductor for 5 minutes.

Question 2

A Choose the correct answer :

1. Which one of these traits is dominant in humans ? ....
 a. Smooth hair. b. Freckles in the face. c. Wide eyes. d. Absence of dimples.

2. The charge transmitted by a constant current of intensity one ampere in one second is ....
   a. coulomb. b. volt. c. joule. d. ohm.
3. The most active metal in the chemical activity series is ....
   a. copper. b. sodium. c. hydrogen. d. aluminium.
4. The recessive trait appears in one of the sons if he inherited from his parents ....
   a. two dominant genes. b. one dominant gene.
   c. a recessive gene. d. a recessive gene and a dominant gene.
5. If a pollination occurs between two hybrid individuals, the product is 200 individuals, so the number of produced hybrid individuals is likely to be .... individual.
   a. 50 b. 100 c. 150 d. 200

B What happens ..... ?

1. To the colour of solution as time passes when adding sodium hydroxide solution to blue copper sulphate solution. (Without equations)
2. When exposing a man for a large dosage of radiation for a short period of time.
3. When heating most metal sulphates. (Without equations)

C Compare by drawing only between :

The direct current and the alternating current.

Question 3

A Write the scientific term for each of the following :

1. It's the substance which speeds up the chemical reaction without changing.
2. The resistance of a conductor that allows the passing of an electric current of 1 ampere through it when the potential difference across its ends is 1 volt.
3. The process of spontaneous decaying of atoms of some elements present in nature to reach a more stability.
4. The trait that appears in all individuals of the first generation in Mendel's experiments.
5. A type of connection of similar electric cells used to obtain high (twice) e.m.f. (electromotive force).

B Illustrate by balanced chemical equations the following reactions :

1. The effect of heat on sodium nitrate.
2. The reaction of diluted hydrochloric acid with sodium carbonate.

C Give reasons for :

1. Mendel selected (chose) the pea plant to conduct his experiments.
2. The radioactive wastes should be buried away from underground water's path.
3. The speed of the chemical reaction increases as the concentration of the reactants increases.

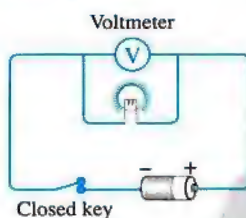
PART 3

Question 4

A Rewrite the following statements after correcting the underlined words :

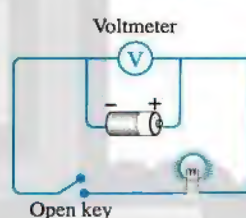
1. Mendel removed the **petals** from the pea plant flowers before the anther becomes mature.
2. In dry cell, **mechanical** energy is converted into electric energy.
3. Metals substitute hydrogen of water to produce metal **carbonate** and hydrogen gas evolves.
4. The ratio of gametes "TR" in a pea plant whose genetic structure TtRr is **75%**.
5. Some traits are not transmitted from one generation to another and they are called the **hereditary traits**.

B (1) Complete :



The voltmeter is used to measure ....

(2) Complete :



The voltmeter is used to measure ....

C (1) When hydrogen passes through hot copper oxide, hydrogen takes the oxygen away from copper oxide and water is formed and copper oxide turns into copper.

(1) Show this by symbolic balanced chemical equation with writing the conditions of the reaction.

(2) Determine the substance which is oxidized–reduced.

(2) Mention the name of the scientists who discovered the means of how the gene controls the appearance of a trait.

Additional questions

A Give reasons for :

1. Iodine salt is preferred than the normal salt.
2. Some persons have enlarged thyroid gland.
3. Pancreas is a double function gland.

B Complete :

In the catalytic converter, the ceramic cells covered with a thin layer of .... metal as .... or palladium.

6 El-Menofia Governorate

Answer the following questions :

Question 1

A Write the scientific term for each of the following :

1. An arrangement of metals in a descending order according to the degree of their chemical activity.
2. A chemical process which causes the increase in the oxygen percentage or decrease in the hydrogen percentage in a substance.
3. It is the state of an electric conductor that shows the transfer of electricity from or to it when it is connected to another conductor.
4. The opposition that the electric current faces during its passage in a conductor.
5. It chemically consists of a nucleic acid called DNA binds with protein.
6. The plant that is used by Mendel in his experiments.

B In front of you in the school lab the following substances :

(Hydrochloric acid – Silver nitrate – Sodium carbonate – Sodium chloride)

Explain how can you get : by symbolic balanced chemical equations.

1. A white precipitate.
2. A gas turbids limewater.

C What happens in the following cases ..... ?

1. A gene failed to produce its own enzyme.
2. Human body is exposed to a large dosage of radiation for a short time.

Question 2

A Extract the unsuitable words, then write the link between the rest :

1. Diagnose some diseases – Eliminate pests – Drilling for petroleum – Ohmmeter.
2. Pressure – Potential difference – Electric resistance – Current intensity.
3. Convert mechanical energy to electric energy – Produce alternating current – Produce direct current – Used in lighting of houses.
4. Ability to roll the tongue – Attached ear lobe – Curly hair – Wide eyes.

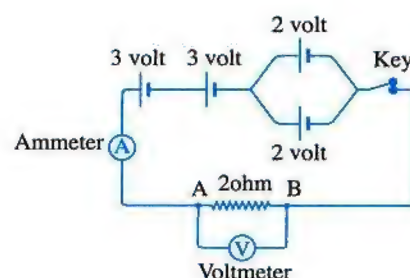
B Compare between :

1. Metal oxide and metal hydroxide (the effect of heat on both of them).
2. Hereditary traits and acquired traits (concerning : the definition).
3. Ordinary rice and genetically modified rice (concerning : the vitamins exist in both of them).

PART 3

C In the opposite figure. Calculate :

1. The reading of the ammeter.
2. The work done to transfer the electric charge between (A) and (B) during 2 minutes.



Question 3

A Choose the correct answer :

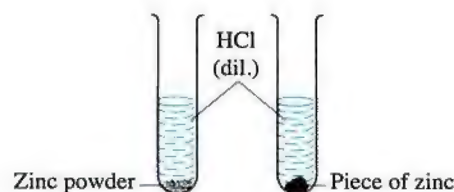
1. The two hereditary factors of the trait are similar in .... individual.
   a. pure dominant b. hybrid
   c. recessive d. pure dominant and recessive
2. Electric current intensity = ...
   a. $q \times t$ b. $\frac{q}{t}$ c. $V \times R$ d. $\frac{R}{V}$
3. .... is used to measure the electromotive force (e.m.f.) of a battery.
   a. Voltmeter b. Ohmmeter c. Ammeter d. The sliding rheostat
4. In the following reaction : $H_2 + CuO \xrightarrow{\Delta} H_2O + Cu$ .... is the oxidizing agent.
   a. CuO b. H_2O c. Cu d. H_2
5. If two hybrid individuals crossing with each other and (300) individuals produced due to this crossing, so the number of hybrid individuals among the offspring is likely to be .... individual.
   a. 50 b. 100 c. 150 d. 200

B Explain the importance of each of the following :

1. The sliding rheostat in electric circuit.
2. Electric transformer.
3. The human genome.

C From the opposite figures. Show :

1. The type of the chemical reaction.
2. The factor that affects the speed of this reaction.
3. Write the balanced symbolic chemical equation express this reaction.



Question 4

A Complete the following :

1. $2N_2O_5 \longrightarrow$ .... $+ O_2 \uparrow$
2. When blue copper sulphate is heated, ... gas evolves.

3. .... are parts of DNA on the chromosomes and control the hereditary traits of the individuals.
4. .... is considered as very slow chemical reactions.
5. .... is a device used to provide electric devices with the electric current when no current at home.

B What's meant by ..... ?

1. Chemical reaction.
2. Natural radioactivity.

C Give reasons for :

1. A gas evolves on putting a piece of aluminium in diluted hydrochloric acid.
2. Food preservation in the freezer of the refrigerator.
3. When a pure yellow pod pea plant crossed with a pure green pod, the whole produced individuals were green pods.

Additional questions

Choose the correct answer :

1. Sodium bicarbonate is used in polishing silver by using a piece of .... during washing.
   a. copper foil b. zinc foil c. aluminium foil d. chrome foil
2. Glucagon hormone is secreted by ....
   a. pituitary gland. b. thyroid gland. c. adrenal gland. d. pancreas gland.
3. .... element shares in composing thyroxin hormone.
   a. Iodine b. Iron c. Sodium d. No correct answer

7 El-Gharbia Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. .... gas turbids the clear limewater.
2. The curly hair trait dominates over the straight hair trait is follows the principle of .... in human being.
3. Some reactions are very slow and need several months to take place, such as the formation of ....
4. The .... project is interested in the effect of the various mutations on the function of the genes.
5. The electric current produced from electrochemical cells (batteries) is known as the .... current.

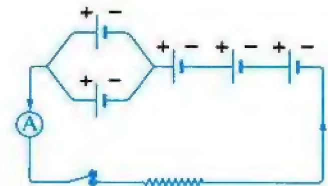
PART 3

B Give reasons for :

1. Copper does not react with diluted hydrochloric acid.
2. Radium is considered as a radioactive element.
3. In Mendel's experiment to study the seed colour of pea plant, he removed the stamens of their flowers before the anther becomes mature.

C In the opposite electric circuit :

If the e.m.f. for each cell equals 1.5 volt, and the value of the resistance equals 3 ohm, when the circuit is closed, calculate :



1. The e.m.f. of the battery.
2. The reading of the ammeter.

Question 2

A Choose the correct answer :

1. The recessive trait appears on the individuals when they receive from their parents ....
   a. two dominant genes. b. one recessive gene.
   c. two recessive genes. d. one dominant gene and one recessive gene.
2. To control the value of the current intensity that passes in the different parts of the circuit, we use the .... instrument.
   a. ammeter b. voltmeter c. ohmmeter d. rheostat
3. When magnesium substitutes copper in copper salt solutions, the colour of the precipitate is ....
   a. black. b. red. c. blue. d. green.
4. The two hereditary factors that control the trait are similar if the trait is pure, and the living organism is called ....
   a. pure. b. hybrid. c. recessive. d. hybrid recessive.
5. At the start of the chemical reaction, the ratio of the concentration of the reactants is ....
   a. 100% b. 75% c. 50% d. 25%

B Mention only one use for each of the following :

1. The alternating electric current.
2. The uncut electric charger device.
3. The nuclear energy in the agricultural field.

C Use the following symbols to show the results of the mixed pollination between two pea plants, where one carries two pure dominant traits, tall stem and red flowers (TTRR) and the other carries two recessive traits, short stem and white flowers (ttrr) (The first generation only).

Question 3

A Write the scientific term for each of the following :

1. The changes that appear on a living organism as a result of exposure to radiation.
2. An enzyme that is found in sweet potato and helps in decomposition of hydrogen peroxide.
3. The state of an electric conductor that shows the transfer of the electricity from or to it, when it is connected to another conductor.
4. A substance changes the rate of the chemical reaction without being changed.
5. It is chemically consisted of a nucleic acid called DNA binds with protein.

B Compare between each of the following :

1. The hereditary traits and the acquired traits (in terms of definition).
2. The ammeter and the voltmeter (in terms of the way of connection in the electric circuit).
3. The oxidizing agent and the reducing agent (in terms of the concept).

C Illustrate by balanced symbolic equations the following reactions :

1. The reaction between hydrochloric acid and sodium hydroxide.
2. The effect of heat on sodium nitrate.

Question 4

A Correct the underlined words in the following sentences :

1. The electric generator (dynamo) converts **sound** energy into electric energy.
2. The mixed pollination between pea plants with pure yellow seeds and pea plants with pure green seeds, produces pea plants with **pure green** seeds.
3. The rate of a chemical reaction increases when the temperature of the reaction is **constant**.
4. Mendel chose **ten** main traits of pea plants to conduct his experiments.
5. When adding silver nitrate solution to sodium chloride solution, a **red** precipitate of silver chloride is formed.

B What happens in the following cases ..... ?

1. The gene cannot give its special enzyme.
2. Passing of hydrogen gas through a hot copper oxide.
3. Replacing a piece of iron with iron filings of the same mass when reacting with the same volume of diluted acids.

C Calculate the current intensity due to the flow of 4500 coulomb through a cross-section of a conductor for 5 minutes.

Additional questions

A Write a short note about the uses of sodium bicarbonate in the garden and in the home.

B Mention the importance of the air bags.

PART 3

8 El-Dakahlia Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. The reaction in which double substitution occurs between the ions of two compounds to form two other new compounds is called .... reaction.
   a. double substitution
   b. simple substitution
   c. neutralization
   d. oxidation and reduction
2. The factor that affects the rate of the chemical reaction without itself being changed is the ....
   a. concentration of reactants.
   b. surface area of reactants.
   c. catalyst.
   d. temperature.
3. To generate an alternating current, we use the ....
   a. dynamo.
   b. dry cell.
   c. dry battery.
   d. all of the previous answers.
4. Mendel chose the garden pea plant to conduct his researches for these reasons except one of them, ...
   a. it is easy to be planted the pea plant.
   b. it can self-pollinate.
   c. it can easily be artificially pollinated.
   d. its life cycle is long.
5. .... consists of nucleic acid DNA joined with protein.
   a. The gene
   b. The thymine
   c. The chromosome
   d. The cytoplasm

B Show by an experiment :

The surface area of reactants affects the speed of chemical reaction (write the steps only).

C A quantity of charge 360 coulomb passes in a conductor through time of one hour, calculate the electric voltage for the electric source if the resistance of the conductor is 2200 ohm.

Question 2

A Complete the following sentences :

1. $Na^+Cl^- + Ag^+$ .... $\longrightarrow$ .... $+ Na^+NO_3^-$
2. The reaction between an acid and an alkali is called .... reaction, while decompose the compounds by heat into its simple components is called .... reaction.
3. Volt is the potential difference between terminals of a conductor when work done of .... to transmit a quantity of charge of .... between them.

4. Electric current produced from dry cell is due to change .... energy to .... energy.

5. The scientists .... and .... discovered the means of how the gene controls the appearance of a trait.

B Compare between :

Dominant traits and recessive traits.

C You have three electric cells, the electromotive force of each cell is 3 volt, show by drawing only how you connect them to obtain electromotive force of :

(1) 3 volts. (2) 6 volts. (3) 9 volts.

Question 3

A Write the scientific term :

1. A chemical process which causes the decrease in the hydrogen percentage in the substance.
2. It is the arrangement of the metals in a descending order according to the degree of their chemical activity where the element which is more active substitutes the less active one.
3. The quantity of electric charges in coulomb flowing through a cross-section of the conductor in one second.
4. The nuclear energy that is released during nuclear reactions done by the scientists that can be controlled or that cannot be controlled.
5. The change in the concentration of the reactants and resultants at a unit time.

B Mention the types of the electric resistance and draw their symbols in the electric circuit

C If you know that the free ear lobe (Y) is dominant trait, while attached ear lobe (y) is recessive trait. Explain on genetic bases the traits of the offspring resulted from the crossing between man and woman both of them is hybrid for these traits (Yy).

Question 4

A Give reasons for :

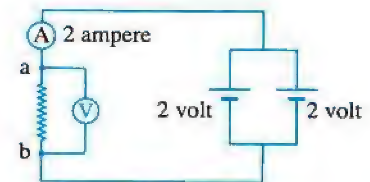
1. When red mercuric oxide is heated, a silvery precipitate is formed.
2. Speed of chemical reaction increases with rise in temperature.
3. Mendel's first law is called the law of segregation of factors.
4. Some of electric circuits contain rheostat.

B What will happen ... ?

1. When heating blue copper hydroxide.
2. If you put a small piece of sodium to flask contains water.

PART 3

Ⓒ From the opposite circuit, find the work done required to transfer a quantity of electric charge between points (a) and (b) through 5 minutes if the electromotive force of each cell is two volt and the reading of ammeter is two ampere.



Additional questions

Ⓐ Complete the following equation :

$2NaN_3 \xrightarrow[\text{Spark}]{\text{Electric}}$ .... + ...

Ⓑ Mention the role or the function of each of the following :

1. Hormones.
2. Endocrine glands.
3. Iodine salt.

9 Ismailia Governorate

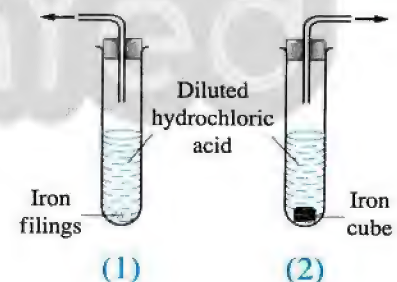
Answer the following questions :

Question 1

Ⓐ Complete the following statements with suitable words :

1. The current intensity is measured by using ...., but voltmeter is used for measuring the ....
2. The chromosome is chemically consisted of a nucleic acid called .... binds with ....
3. $Cu(OH)_2 \xrightarrow{\Delta}$ .... + ...

Ⓑ From the opposite figures :



1. What is the kind of chemical reaction ?
2. Express this reaction with a balanced chemical equation.
3. What is the factor affecting the rate of the reaction ?
4. What happens on replacing iron by copper ? Why ?

Question 2

Ⓐ Write the scientific term for each of the following statements :

1. The trait that appears in all individuals of the first generation in Mendel's experiments.
2. The flow of electric negative charges in a conducting substance.
3. The measuring unit of absorbed radiation.
4. The arrangement of metals in a descending order according to the degree of their chemical activity.
5. An enzyme found in sweet potato helps in decomposition of hydrogen peroxide.

B **Calculate the quantity of electricity passing in a conductor of a resistance 2200 ohm for two minutes if the potential difference between its terminals equals 220 volt.**

C **Compare between :**

The electric current represented by each figure according to the kind.

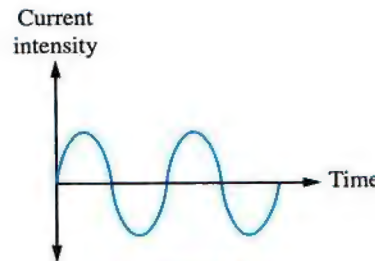


Figure (1)

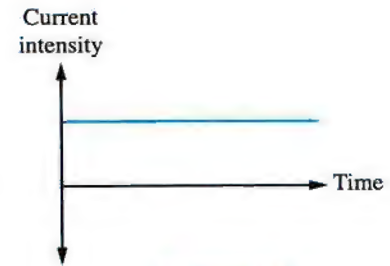


Figure (2)

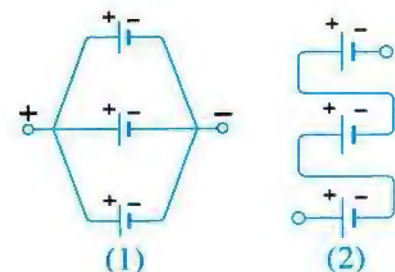
Question 3

A **Choose the correct answer :**

1. Ohmmeter is used in measuring the ....
   a. potential difference. b. current intensity.
   c. electric resistance. d. quantity of electricity.
2. From the non-radioactive elements is ....
   a. radium. b. uranium. c. iron. d. cesium.
3. If a pollination is happened between two individuals, each of them is hybrid, the product is 200 individuals, so the number of hybrid individuals is likely to be .... individual.
   a. 50 b. 100 c. 150 d. 200
4. When dry hydrogen passes on hot black copper oxide, ... occur(s).
   a. oxidation b. reduction
   c. oxidation and reduction d. no correct answer
5. The recessive trait appears on one of the offspring if it was inherited from parents ....
   a. two dominant genes. b. one dominant gene.
   c. two recessive genes. d. a dominant gene and a recessive gene.
6. At the start of the reaction, the concentration of reactants is ....
   a. 100% b. zero % c. 50% d. 25%

B **From the two opposite figures :**

Which figure gives higher voltmeter reading, when the voltmeter is connected with battery (1) or when it is connected with battery (2) ? Why ?
(Given that all the cells are similar)



C **Mention one function for the following :**

1. The electric transformer.
2. The nuclear energy in the medical field.

PART 3

Question 4

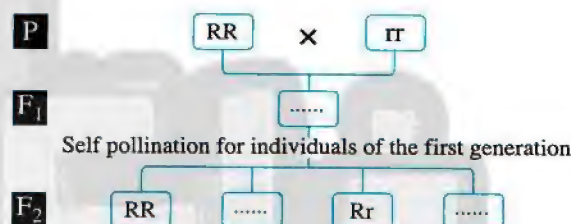
A Correct the underlined words :

1. Most of metal carbonates decompose when heated into **metal** and carbon dioxide.
2. The unit of measuring the electric charges is **volt**.
3. The electric current intensity passing in a conductor is directly proportional to the **resistance** at constant temperature.
4. Mendel's second law is called the law of **segregation of factors**.

B Give reasons for :

1. Preserving food in the freezer of the refrigerator.
2. Red precipitate is formed on adding a piece of magnesium to copper sulphate solution (Write the chemical equation of the reaction with your answer).

C The opposite figure illustrates a cross-pollination : between a pea plant with red flowers and another pea plant with white flowers :



1. Determine by symbols the individuals of the first generation.
2. Fill in gabs the second generation.
3. Is the results verify Mendel's first law ? State your reason.

Additional questions

What would happen ...... ?

1. When the glands that secrete hormones have ducts.
2. If the secretion of growth hormone is increased at childhood.
3. To the human when thyroxin hormone secretion increases.

10 Port Said Governorate

Answer the following questions :

Question 1

A Write the scientific term for each of the following statements :

1. They are parts of DNA present on the chromosomes and control the hereditary traits of the individual.
2. The breaking up of bonds in reactants molecules and formation of new bonds in the products molecules.

3. The state of an electric conductor that shows the transfer of the electricity from or to it, when it is connected to another conductor.
4. A substance which increases the rate of chemical reaction without sharing in the reaction.
5. A science that researches the transmission of the hereditary traits from one generation to another.

B Give reasons for :

1. Gold does not react with acids.
2. When a yellow pod pea plant is pollinated with a pure green pod pea plant, they produce plants that are all with green pods.
3. It is better to use the alternating current rather than the direct current.

C Calculate the quantity of electric charges passing through a conductor for two minutes, if the value of its resistance is 2200 ohm, and it is connected to a source of electric current its potential difference is 220 volt.

Question 2

A Complete each of the following :

1. At the beginning of the chemical reaction, the concentration of reactants is .... %
2. Garden pea plant can be easily ....
3. On connecting two charged conductors, the electric current passes from the conductor with .... potential to the conductor with .... potential.
4. Zinc reacts with diluted hydrochloric acid forming a salt called ....

B Mention the efforts (discoveries) of each of the following scientists :

1. Ohm.
2. Watson and Crick.
3. Henri Becquerel.
4. Badel and Tatum.

C Illustrate by balanced symbolic equations each of the following reactions :

1. Neutralization reaction.
2. Oxidation-reduction reaction.

Question 3

A Rewrite the following statements after correcting the underlined words :

1. **Acquired** traits are transmitted from one generation to another.
2. **Magnetic** energy converts into electric energy in dry cells.
3. Most metal carbonates decompose by heat into **metal** and carbon dioxide.
4. The electric current intensity is **inversely** proportional to the potential difference.
5. The unit of measuring the electromotive force (e.m.f.) is the **coulomb**.

B Explain an activity to discover the effect of temperature on the rate of chemical reactions.

PART 3

C Use the symbols (Tt) to express the results of the pollination between two hybrid (heterozygous) tall stem pea plants with each other.

Question 4

A Choose the correct answer :

1. When magnesium substitutes copper in one of its salt solutions, a .... precipitate is formed.
   a. black b. red c. white
2. The sliding rheostat is used in the electric circuit to ....
   a. measure current intensity.
   b. measure potential difference
   c. change (control) the value of the electric resistance.
3. The two factors of every hereditary trait are similar if the trait is ....
   a. homozygous. b. hybrid. c. recessive and hybrid.
4. An instrument known as the .... is used to measure the electric resistance.
   a. ammeter b. ohmmeter c. voltmeter

B Compare between :

1. Ionic compounds and covalent compounds. [In terms of the speed of their reactions]
2. The dominant trait and the recessive trait. [In terms of their definition]

C Show by a diagram how to connect three electric cells :

1. In parallel. 2. In series.

Additional questions

A Complete the following sentences :

1. The most modern cars are equipped with .... which helps in treatment of harmful gases emitted from the car engine.
2. The .... hormone promotes the growth of endometrium.

B Mention the idea of operation of the air bags.

11 Suez Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. The scientist .... is the founder of heredity.
   a. Mendel b. Ohm c. Becquerel d. Watson

2. .... is a non-radioactive element.

a. Radium b. Uranium c. Iron d. Cesium

3. To generate an alternating electric current, we use the ....

a. rheostat. b. dynamo. c. ammeter. d. ohmmeter.

4. The parts of DNA present on the chromosomes and control the hereditary traits of the individual is/are ....

a. genes. b. gametes. c. cytoplasm. d. (b) and (c) together.

B Illustrate by balanced chemical equations each of the following reactions :

1. Adding silver nitrate solution to sodium chloride solution.
2. The effect of heat on copper sulphate.

C Mention the importance of the following :

1. The sliding rheostat. 2. A catalyst on a chemical reaction.

Question 2

A Correct the underlined words in the following statements :

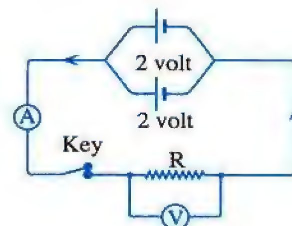
1. Most metal carbonates decompose on being heated into **metal** and carbon dioxide.
2. The reactions of ionic compounds are **slower** than that of the covalent compounds.
3. Every gene gives a special **hormone** responsible for the occurrence of a reaction resulting in a protein showing a hereditary trait.
4. In the electric cell, **magnetic** energy is converted into electric energy.

B Give reasons for :

1. Magnesium replaces hydrogen of the acids.
2. Alternating current is preferred than the direct one.
3. The ability of rolling the tongue is a dominant trait in the human being.

C In the opposite figure :

If a quantity of electricity which passes in the electric circuit through 60 second is 30 coulomb. Find :



1. The ammeter reading (A).
2. The voltmeter reading (V).
3. The value of the resistance (R).

Question 3

A Complete each of the following sentences :

1. The .... is the substance which gives oxygen and takes away hydrogen.
2. At the beginning of the chemical reaction, the concentration of reactants is .... %.

PART 3

3. The .... is used to measure the electromotive force of a battery.
4. Chromosome is chemically composed of a nucleic acid called DNA which is combined with ....

B What happens when ... ?

1. Increasing the temperature of chemical reaction.
2. Two charged conductors of different electric potential are touched.
3. Exposure of the human body to a large dosage of radiation for a short time.

C Use the symbols to express the mating between two pea plants, one of them is hybrid red flowers and the other is white flowers.
[Knowing that the symbol of the dominant gene is (R) and the recessive gene is (r)]

Question 4

A Write the scientific term for each of the following sentences :

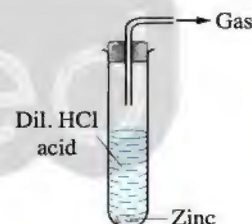
1. The unit that is used to measure the absorbed radiation.
2. Reaction of an acid and a base to give salt and water.
3. The trait that appears in all individuals of the first generation in Mendel's experiments.

B Compare between each of the following :

1. The inherited (hereditary) traits and the acquired traits [according to : the definition].
2. Ammeter and voltmeter [according to : the way of connection in the electric circuit].

C In the opposite figure :

On adding diluted hydrochloric acid to zinc, a gas is evolved.
1. What is the name of the evolved gas ?
2. What do you observe if zinc is replaced by copper ?



Additional questions

Write the scientific term for each of the following sentences :

1. Organs secrete hormones directly into blood stream.
2. A chemical message that controls and regulates the activities and functions of most of the body.
3. They are considered one of the most important safety means in cars at emergencies.
4. The substance that is used in polishing silver or any decorative metal pieces made of copper or chrome.

12 Damietta Governorate

Answer the following questions :

Question 1

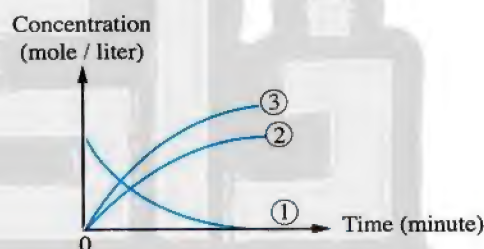
A Complete the following statements :

1. The .... current can be transferred for short distances only, while the .... current can be transferred for short and long distances.
2. Radioactive wastes should be buried away from .... path and areas may be exposed to ....
3. The skill of swimming is one of the .... traits, while blood group is one of the .... traits.
4. The .... apparatus is used to store the electric energy, while the ....apparatus is used to measure the electromotive force.
5. $NaCl + AgNO_3 \longrightarrow$ .... + ...

B The opposite graph represents the rate of rapid decomposition of (X) compound as in the following equation :

$2X \longrightarrow 2Y + Z$

Replace the numbers on the figure by suitable substance (X , Y , Z) from the equation.



C What are the results of ... ?

1. The length of rheostat wire increases in the electric circuit (related to the electric current intensity).
2. Changing the chemical composition of blood hemoglobin.

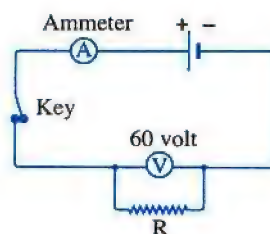
Question 2

A Write the scientific term for each of the following statements :

1. A substance which speeds up the chemical reaction without changing.
2. Chemically it consists of a nucleic acid combined with protein.
3. Cells by which the chemical energy is converted into electric energy.
4. The process of spontaneous decaying of atoms nuclei of some elements present in nature to reach a more stable composition.
5. The force that is needed to bind the nucleus components together and to overcome the repulsion force between the positively charged protons.

PART 3

B **Calculate the electric current intensity passing in the opposite electric circuit, if the work done to transfer the electric charge is 540 joule and time of flowing is 3 second.**



C **Give reasons for :**

1. The fridge is used to preserve food.
2. The exposure to radiation has genetic effects.

Question 3

A **Choose the correct answer :**

1. The mathematical relation of Ohm's law is ....
   a. $R = \frac{V}{I}$ b. $R = \frac{I}{V}$ c. $I = \frac{R}{V}$ d. $V = \frac{I}{R}$
2. All of the following are factors affecting the rate of chemical reaction except ....
   a. the concentration of reactants. b. the nature of reactants.
   c. the nature of products. d. the temperature of the reaction.
3. In human being, there are dominant traits, from which ....
   a. smooth hair. b. attached ear lobe. c. narrow eyes. d. absence of freckles
4. The radioactivity phenomenon was discovered by the scientist ....
   a. Ohm. b. Henri Becquerel. c. Mendel. d. Watson.
5. The genetically modified rice contains ....
   a. folic acid. b. vitamin (A). c. carotene. d. melanin.

B **If you have four electric cells, the electromotive force of each is 2 volt :**

Show by drawing only, how can you connect them to obtain a battery of an electromotive force of 4 volt with three different ways.

C **Compare between oxidation and reduction processes including :**

- Traditional concept. - Electronic concept.

Question 4

A **Rewrite the following statements after correcting the underlined words :**

1. Dynamo converts the **chemical** energy to electric energy.
2. The measuring unit of the absorbed radiation is the **coulomb**.
3. Mendel removed the **petals** of pea plant flowers to insure that the plant does not self pollinate.
4. **The electric current intensity** is the state of an electric conductor that shows the transfer of electricity from or to it when it is connected to another conductor.
5. The ratio of gametes TR in a plant whose genetic structure TtRr is **75%**.

B **Choose from columns (B) and (C) what suit with column (A), then write the complete statements :**

(A) The reaction	(B) Gas produced	(C) Type of reaction
1. Zinc with dil. hydrochloric acid.	A. $SO_3 \uparrow$	a. Precipitation reaction.
2. Heating copper sulphate.	B. $CO_2 \uparrow$	b. Simple substitution.
3. Sodium carbonate with hydrochloric acid.	C. $O_2 \uparrow$	c. Thermal decomposition.
	D. $H_2 \uparrow$	d. Double substitution.
		e. Direct combination.

C **Explain on genetic bases :**

The traits of the individuals resulted from mating hybrid black male mouse with hybrid black female mouse. If the black colour gene (B) dominates over the brown colour gene (b).

Additional questions

Choose the correct answer :

1. The ceramic cells in the catalytic converter leads to ....
   a. increasing the surface area exposed to the reaction.
   b. increasing the concentration of the reactants.
   c. increasing the temperature.
   d. no correct answer.
2. The .... is the only way for hormones to reach their sites of action.
   a. enzyme b. lymph c. blood d. duct
3. Man suffers from .... disease when his food lacks of iodine.
   a. dwarfism b. diabetes c. gigantism d. simple goiter

13 Kafr El-Sheikh Governorate

Answer the following questions :

Question 1

A **Write the scientific term for each of the following statements :**

1. The scientists who made a model for the DNA molecule.
2. A substance which slows down the speed of chemical reaction and does not change during the reaction.
3. The state of an electric conductor that shows the transfer of the electricity from or to it when it is connected to another conductor.
4. The process of spontaneous decaying of atoms of some elements that are present in nature to reach a more stability.

PART 3

B **Compare between :**

Alternating electric current and direct electric current (in view of uses).

C **Write the balanced chemical equations of the following reactions :**

1. Reaction between hydrochloric acid with sodium carbonate.
2. Heating of red mercuric oxide.

Question 2

A **Choose the correct answer :**

1. The substance which loses one electron or more during the chemical reaction is named ....
   a. catalyst. b. reducing agent. c. oxidizing agent. d. enzyme.
2. The ohmmeter is used to measure the .... in the electric circuit.
   a. potential difference b. resistance
   c. current intensity d. quantity of electricity
3. .... is a radioactive element.
   a. Calcium b. Radium c. Iron d. Barium
4. The first person who started the scientific study of heredity through experiments is ....
   a. Ohm. b. Watson. c. Mendel. d. Wohler.

B **What happens when .... ?**

1. Exposure of human body cells to small dosage of radiation for a long period of time.
2. Increasing the quantity of electricity which flows through a cross-section of the conductor in one second.

C **What is the type of ..... ?**

1. Process : $Ag^{+1} + e^{-} \longrightarrow Ag$
2. The reaction between an acid and an alkali to form salt and water.

Question 3

A **Give reasons for :**

1. Polonium is a radioactive element.
2. Electric current will not flow between two charged conductors have the same electric potential.

B **Calculate the current intensity due to the flow of 5400 coulomb through a cross-section of a conductor for 5 minutes.**

C **Complete the following statements :**

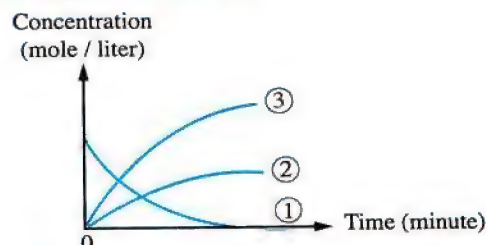
1. The measuring unit of quantity of charge is the ....
2. The measuring unit of absorbed radiation is the ....
3. The two factors of hereditary trait are not similar in the .... individual.

Question 4

A The following equation represents decomposition of (N_2O_5) compound

$$2N_2O_5 \longrightarrow 4NO_2 + O_2$$

The opposite graph illustrates the change in the concentration of reactants and resultants in respect to time. Write the name of the element or the compound to which each number refers.



B Use the following symbols to express the results of mating between pure yellow seeds pea plant (CC) with pure green seeds pea plant (cc) (explain your answer on genetic bases).

C Rewrite the following statements after correcting the underlined words :

1. The **ammeter** is used in changing resistance.
2. The radioactivity was known for the first time by the scientist **Ohm**.
3. First law of Mendel is named the law of **independent assortment of the hereditary factors**.
4. Most metal carbonates decompose on being heated into **metal** and carbon dioxide.

Additional questions

A Write the scientific term for each of the following :

1. The hormone which controls the level of calcium in the blood.
2. The hormone that stimulates body organs to respond to emergencies.
3. The element that enters in the composition of thyroxin hormone.

B Choose the correct answer :

Sodium bicarbonate is used in polishing silver by using a piece of .... during washing.

a. copper foil b. zinc foil c. aluminium foil d. chrome foil

14 El-Behira Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. On heating copper sulphate, a .... precipitate is formed.

a. black b. green c. blue d. red

2. .... increase the number of collisions between molecules and consequently the speed of chemical reaction increases.
   a. Increasing the reaction temperature
   b. Adding a catalyst
   c. Increasing the reactants concentration
   d. Both (a) and (c)
3. .... is a non-radioactive element.
   a. Radium
   b. Uranium
   c. Iron
   d. Zirconium
4. Mendel has covered .... of the pistils in order not to cross pollinate from other flowers.
   a. stamens
   b. stigmas
   c. sepals
   d. petals
5. If an electric current whose intensity is one ampere passes through a resistance of 20 ohm, then the intensity of the electric current increases to 2 ampere in the same resistance, so the value of resistance ....
   a. increases to double.
   b. decreases to half.
   c. decreases to quarter.
   d. does not change.

B What happens ...?

1. When two electrically charged conductors touch, where the electric potential of the first conductor is higher than the electric potential of the second conductor.
2. When adding silver nitrate solution to sodium chloride solution.
3. If the resistance used in verifying Ohm's law is burnt related to the ammeter and voltmeter readings.

C Illustrate by an experiment the effect of the surface area on the speed of the chemical reaction using the following table :

Procedures	Observation	Conclusion
		The speed of chemical reaction increases by increasing the surface area of the reactants exposed to reaction.

Question 2

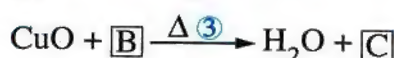
A Write the scientific term for each of the following :

1. The flow of electric negative charges in a conducting material.
2. A physical quantity which is measured by (volt × coulomb).
3. The traits that are not transmitted from one generation to another.
4. The individual who carries a similar pair of genes either dominant or recessive.

B Study the following reactions, then answer :

$\boxed{A} \xrightarrow{\Delta \ ①} H_2O + CuO$

$2Na + 2H_2O \xrightarrow{②} 2NaOH + \boxed{B}$

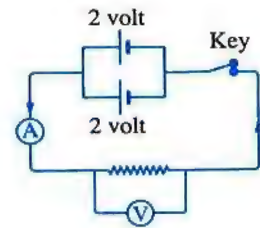


$CuO + \boxed{B} \xrightarrow{\Delta \ ③} H_2O + \boxed{C}$

1. Write the chemical formula for [A], [B] and [C].
2. What is the type of chemical reactions ①, ② & ③ ?
3. What is the name of the process that happens to black copper oxide? And why ?

C In the opposite circuit :

If the quantity of electricity which passes through the electric circuit in a time 40 second is 20 coulomb. Find :



1. The ammeter reading.
2. The voltmeter reading.
3. The value of resistance.

Question 3

A Complete the following sentences :

1. The resistance is measured by using .... and has a measuring unit known as ....
2. The ...., genetic and .... effects are due to exposure to a small dosage of radiation for a long time.
3. The reaction between acid and alkali gives .... and ....
4. During the chemical reaction, the concentration of the reactants .... gradually, while the concentration of the resultants .... gradually.
5. The .... project discovered that more than .... % of the DNA is similar in humans.

B Mention each of the following :

1. Common factors of catalysts. (only two)
2. State the contributions of the scientist Dr. Ali Mostafa Mosharafa in the field of atom.
3. The scientific idea of producing rice that contains carotene.

C When male and female fruit flies, both have long wings were crossed. The output was (27) have long wings and (9) have short wings. Explain the results on genetic bases when the long wing gene is (T) and the short wing gene is (t).

Question 4

A Give reasons for :

1. It is better to use the alternating current rather than the direct current.
2. Copper does not react with diluted acids.
3. Reactions between ionic compounds are fast whereas, reactions between covalent compounds are slow.

PART 3

B The following table represents the relation between the electromotive force (e.m.f.) of a group of electric cells and the number of this electric cells.

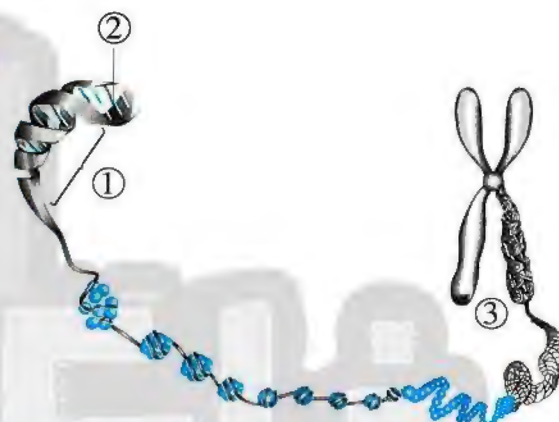
The number of electric cells	1	2	3	4	5
The e.m.f. (Volt)	1.5	3	4.5	6	7.5

Answer the following :

1. Draw a graphical relation between the e.m.f. on Y-axis and the number of electric cells on X-axis.
2. From the graph find the electromotive force of one cell.
3. What is the type of connection of cells ?

C First : Study the opposite figure, then answer :

1. Give the name of ①, ② & ③.
2. Mention the name of the structural units of number ①.
3. Mention the name of chemical structure of number ③.



Second : Mention two reasons for choosing Mendel the pea plant to conduct his experiments.

Additional questions

A Write the uses of sodium bicarbonate in the garden.

B Write the scientific term for each of the following :

1. A metallic can exists in most modern cars to treat the harmful gases emitted from the car engine.
2. The element that enters in the composition of thyroxin hormone.

15 El-Fayoum Governorate

Answer the following questions :

Question 1

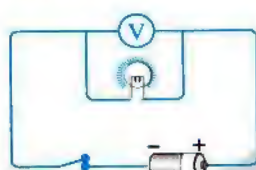
A Complete the following sentences :

1. The .... is used to measure the electric resistance.
2. From very slow reactions which need several months is ....
3. The pea plant is easy to .... and its life cycle is ....
4. The speed of chemical reaction can be practically measured by the rate of .... of reactants or the rate of .... of resultants.

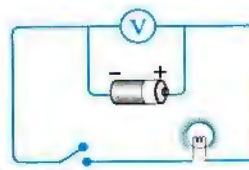
B What would happen in each of the following .... ?

1. The length of the rheostat wire increases in the electric circuit (related to the electric current intensity).
2. The gene cannot produce its special enzyme.

C What is the importance of voltmeter in the two circuits (first is closed and second is opened) :



First circuit



Second circuit

Question 2

A Choose the correct answer :

1. One of the properties of the direct current that it is ....
   a. changable value. b. changable direction. c. constant value and direction.
2. The rate of breaking up of hydrogen peroxide increases by the addition of ....
   a. manganese oxide. b. magnesium oxide. c. manganese dioxide.
3. According to Mendel's first law, the hereditary factors .... when gametes are formed.
   a. combine b. segregate c. disappear
4. The speed of most chemical reactions is .... by rising temperature.
   a. increased b. decreased c. not affected

B Give reasons for :

1. The occurrence of effervescence on putting a piece of aluminium in diluted hydrochloric acid.
2. The wide eyes trait dominates over the narrow eyes trait in human.
3. The electric charges transfer from a charged conductor to another charged conductor.
4. The rate of the reaction of hydrochloric acid with iron filings is faster than a piece of iron has the same mass.

C If an electric current of (20) ampere passes in an electric heater and the potential difference between its two ends is (220) volt, calculate the heater's resistance.

Question 3

A Define the following :

1. Catalyst. 2. Ohm's law. 3. Acquired traits. 4. Radioactive elements

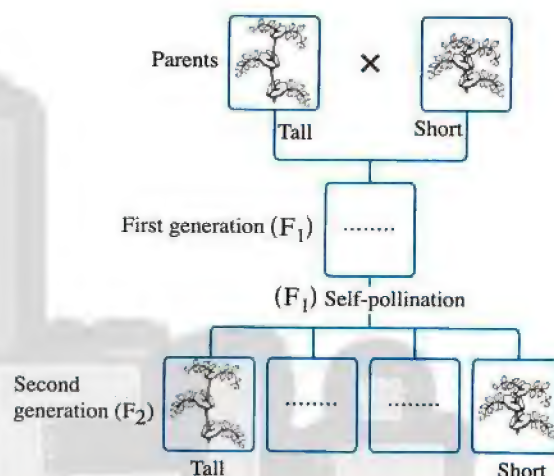
PART 3

B **Write the scientific term for each of the following statements :**

1. The quantity of the electric charges flowing through a cross-section of the conductor in one second.
2. The breaking up of bonds in the reactants molecules and formation of new bonds in the products molecules.
3. It is found in nucleus and carried the genetic material, which is chemically consisted of a nucleic acid called DNA binds with protein.
4. The measuring unit of absorbed radiation.

C **The opposite figure illustrates the mixed pollination between two pea plants, one of short stem and another of tall stem, determine :**

1. The individuals of the first generation.
2. Complete the missing individuals of the second generation and describe them.



Question 4

A **Correct the underlined words in the following statements :**

1. The ammeter connected in **parallel** in an electric circuit.
2. The scientist **Mendeleev** is the founder of heredity.
3. Sodium is monovalent because it **gains** one electron.
4. **Electron** is considered an energy store in the atom.

B **Compare between each pair of the following :**

1. Ionic compounds and covalent compounds (one difference).
2. Pure individual and hybrid (impure) individual (according to : definition).

C **Complete the following equations :**

1. $Cu(OH)_2 \xrightarrow{\Delta}$ .... + ...

2. $NaCl + AgNO_3 \longrightarrow$ .... + ...

Additional questions

Complete the following sentences :

1. Endocrine glands secrete more than .... hormones in the human body.
2. On reaching adulthood stage, ... glands are activated by hormones secreted from pituitary gland.
3. Pancreas is located between the .... and ....
4. .... are considered one of the most important safety means in cars at emergencies.

16 Beni Sueif Governorate

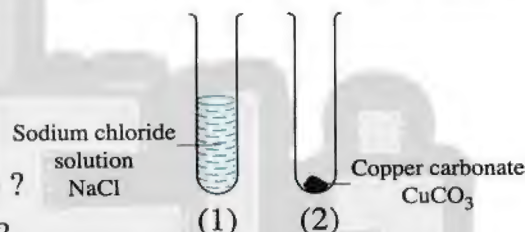
Answer the following questions :

Question 1

A Complete the following sentences :

1. The scientist Henri Becquerel discovered .... phenomenon.
2. The mechanical energy can be converted into electric energy by ....
3. The science that researches the transmission of hereditary traits from one generation to another is ....
4. .... energy is used in the medical field to diagnose and treat some diseases like cancer.
5. Sodium chloride powder reacts .... than a cube of sodium chloride of the same mass.

B In the opposite figures, silver nitrate solution ($AgNO_3$) was added to tube (1) and the tube (2) is heated :



1. What is the colour of the precipitate in the tube (1) ?
2. How could we test the evolved gas in the tube (2) ?
3. Write the chemical equation of the reaction in the tube (2).

C Using symbols to express the results of mating between pure green seeds of pea plant (yy) with another pure yellow seeds (YY). Showing parents, gametes and first generation.

Question 2

A Choose the correct answer :

1. The rate of chemical reaction is increased by rising temperature due to the increase of the ....
   a. surface area exposed to reaction. b. number of molecules.
   c. probable collisions between molecules. d. reactants concentration.
2. Mendel removed the stamens of plant flowers before the anther becomes mature to prevent ....
   a. self pollination. b. cross pollination.
   c. artificial pollination. d. cross and artificial pollination together.
3. All of the following units are used to measure the electric current intensity except ....
   a. ampere. b. coulomb/second. c. joule/coulomb. d. volt/ohm.

PART 3

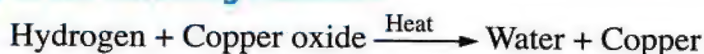
4. According to Mendel's second law, the dominant trait appears in the second generation at a ratio of ....

a. 25 % b. 50 % c. 75 % d. 100 %

5. From the recessive traits which Mendel studied is ....

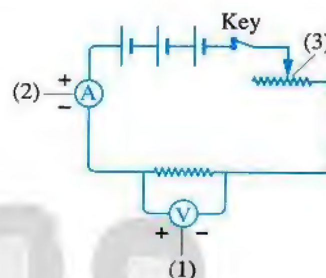
a. tall stem. b. short stem. c. red flower colour. d. smooth seed shape.

B In the following reaction :


Hydrogen + Copper oxide $\xrightarrow{\text{Heat}}$ Water + Copper

1. Why copper oxide is considered as an oxidizing agent ?
2. What is the name of the process that occurred to hydrogen gas ?
3. Write the chemical equation that expresses the previous reaction.

C From the opposite electric circuit, name the digits that are referring to :



1. The device that is used to control the electric current intensity.
2. The device which is connected in the electric circuit in parallel.

Question 3

A Write the scientific term for each of the following statements :

1. The breaking up of bonds in the reactants molecules and formation of new bonds in the products molecules.
2. It is the potential difference between the terminals of a conductor on doing a work of one joule to transfer a quantity of charge of one coulomb.
3. They are parts of DNA present on the chromosomes and control the hereditary traits of the individual.
4. The descending arrangement of metals according to the degree of their chemical activity.
5. Traits which are not transmitted from one generation to another.

B Give reasons for :

1. Mendel selecting pea plant to conduct his experiments.
2. The radioactive wastes should be away from underground water path.
3. Magnesium element replaces copper element in copper sulphate solution (write the balanced equation).

C The opposite figure represents a battery contains four similar cells, the (e.m.f.) for each is 2 volt :

1. Calculate the e.m.f. between point (A) and point (B).
2. By drawing only show how to connect the electric cells of the battery to get a maximum e.m.f.

Question 4

A Correct the underlined words in the following statements :

1. The change in the **volume** of the reactants and resultants at a unit time is known as the speed of chemical reaction.
2. Some metals react with water to produce metal **oxide** and hydrogen gas is evolved.
3. **Alternating** electric current used in electroplating process.
4. The two hereditary factors are similar in **hybrid** individual.
5. The **attached** ear lobe is from dominant traits in the human.

B What would happen in the following cases ..... ?

1. Adding manganese dioxide powder to hydrogen peroxide solution.
2. Man is exposed to large doses of radiation for a short period of time.
3. The gene failed in the production of its special enzyme.

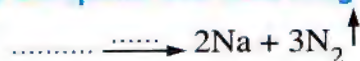
C Calculate the resistance of an electric heater that allows passing of 0.2 ampere of electric current intensity through and its potential difference between its terminals is 220 volt. (Write the law used)

Additional questions

A Choose the correct answer :

1. The .... hormone liberates the needed energy from the food stuff.
   a. growth b. estrogen c. thyroxin d. testosterone
2. The disorder resulted from the increase of thyroxin hormone secretion in large amounts is the ....
   a. exophthalmic goiter. b. simple goiter. c. diabetes. d. dwarfism.
3. Insulin hormone stimulates body cells to .... glucose sugar from the blood.
   a. absorb b. hydrolyce c. decompose d. breakdown

B Complete the following equation :


.... $\xrightarrow{\text{......}}$ $2Na + 3N_2\uparrow$

17 El-Menia Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. Sodium metal can replace all of the following metals in their salt solutions except ....
   a. copper. b. potassium. c. magnesium. d. zinc.

PART 3

2. The .... is used to measure the electric resistance.

a. ammeter b. voltmeter c. ohmmeter d. rheostat

3. The two factors of a hereditary trait are similar in the .... individual.

a. pure b. hybrid c. recessive d. pure and recessive

4. Human being should not be exposed to radiation in amount more than .... rem in a day.

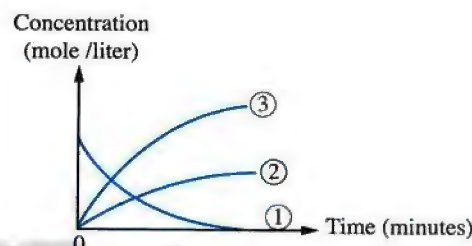
a. 5 b. 8 c. 10 d. 15

B Mention the physical quantity which is measured by the following units :

1. Joule/coulomb.
2. Coulomb/second.

C The opposite figure represents the breaking up of nitrogen pentoxide

1. Write the balanced symbolic equation of this reaction.
2. Replace the numbers on the figure by suitable substances from the equation.



Question 2

A Write the scientific term for each of the following :

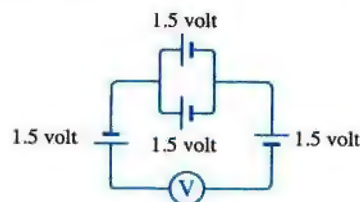
1. It is the state of the electric conductor which determines the transfer of electricity from or to the conductor.
2. The appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed, one of them carries a pure hereditary trait contrasting the trait carried by the other individual.
3. They are chemical substances produced by the body of the living organism, act as catalysts that increase the speed of biological reactions.
4. They are parts of DNA present on the chromosomes and control the individual's hereditary traits.

B Compare between :

1. Covalent compounds and ionic compounds. (according to : The speed of the reaction)
2. The direct current and the alternating current. (according to : The direction)
3. The black eyes and narrow eyes. (according to : The type of trait)

C In the opposite figure, complete the following :

1. The voltmeter reading = ... volt.
2. If all the columns connect on series, the voltmeter reading = ... volt.



Question 3

A Give reasons for :

1. A red precipitate is formed when magnesium is added to copper sulphate solution.
2. Learn to walk in children is not considered as a genetic trait.
3. Some people who depend mainly on eating rice have deficiency in vitamin (A).
4. Some elements are called radioactive elements.

B The following reaction represents concurrent processes, answer the following questions :

$$2CuO + C \xrightarrow{\Delta} 2Cu + CO_2$$

1. Copper oxide undergoes .... process, and considered as .... agent.
2. Carbon undergoes .... process, and considered as .... agent.

C Calculate the quantity of electricity that passes through a conductor of a resistance 2200 ohm for two minutes when it is connected with a source of electric potential 220 volt.

Question 4

A Rewrite the following statements after correcting the underlined words :

1. In the dry cell, the **magnetic** energy is changed into electric energy.
2. Mendel's second law is named by the law of **segregation of factors**.
3. Most metal carbonates are decomposed by heating into metal oxide and **nitrogen** gas.
4. When we add silver nitrate solution to sodium chloride solution, **a black** precipitate is formed.

B What is meant by each of the following ..... ?

1. Chemical reaction.
2. Nuclear binding energy.
3. The human genome project.

C Using symbols to express the results of mating between a long stemmed pea plant (TT) and a short stemmed pea plant (tt) in the first generation. Showing (parents – gametes – offspring).

Additional questions

A What is the importance of the air bags ?

B Write the scientific term :

1. A metallic can exists in most modern cars to treat the harmful gases emitted from the engine.
2. The substance that is used in polishing silver or any decorative metal pieces made of copper or chrome.
3. The disease caused by the increase in the secretion of thyroxin hormone.

PART 3

18 Assiut Governorate

Answer the following questions :

Question 1

A Complete the following statements :

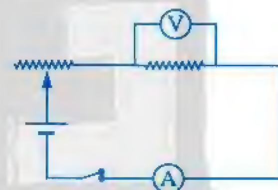
1. A reaction between an acid and an alkali to form salt and water is known as .... reaction.
2. In the dry cell, ... energy is converted to electric energy.
3. Nitrogen pentoxide breaks up into nitrogen dioxide gas and ....
4. The living organism that carries an impure trait is called ....
5. From the peaceful uses of nuclear energy in the agricultural field is ....

B Give reasons for :

1. Mendel chose the pea plant in conducting his experiments. (only two)
2. Ionic compounds are fast in their reactions.
3. The dominance of the wide eyes trait in the human being.

C From the opposite figure :

If the reading of ammeter in the circuit is 10 ampere and the reading of voltmeter is 210 volt.
Calculate the amount of constant electrical resistance, then mention the text of Ohm's law.



Question 2

A Correct the underlined words in the following statements :

1. From **the dominant** traits in the human being is the attached ear lobe.
2. **Oxidizing agent** is a chemical process in which an atom of the element loses an electron or more.
3. The radioactivity phenomenon was discovered by the scientist **Ohm**.
4. From the peaceful uses of nuclear energy in **the medical** field is converting sand to silicon sheets.
5. The scientist Mendel is considered the founder of **physics**.

B What is meant by each of the following .... ?

1. The gene.
2. Chemical activity series.
3. Artificial radioactivity.

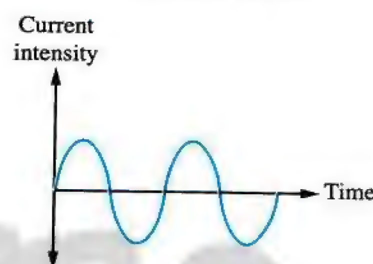
C Write the symbolic balanced equations for the following :

1. A reaction of sodium with water.
2. Placing of a piece of magnesium ribbon in a solution of copper sulphate.

Question 3

A Choose the correct answer :

1. A substance which changes the rate of the chemical reaction without being changed is called ....
   a. a catalyst. b. an oxidizing agent. c. a reducing agent.
2. **In the opposite figure :**
   The electric current represents .... current.
   a. alternating
   b. direct
   c. both of them



3. The chromosome is chemically consisted of a nucleic acid called .... combined with protein.
   a. RNA b. DNA c. HCl
4. The .... effect of radiation are results of changing the sex chromosomes.
   a. physical b. cellular c. genetic
5. A reaction of hydrogen gas with hot copper oxide is called .... reaction.
   a. oxidation and reduction b. double substitution c. simple substitution

B Compare between each of the following :

1. Metal oxide and metal hydroxide. (according to : the decomposition by heat)
2. Hereditary traits and acquired traits. (according to : the concept)

C You have four similar cells, the electromotive force of each is 1.5 volt, explain by using diagrams (by drawing) how you can connect them to obtain an e.m.f. of :

a. 1.5 volt. b. 3 volt. c. 4.5 volt.

Question 4

A Write the scientific term for each of the following :

1. The measuring unit of the absorbed radiation.
2. When two different individuals bearing two pairs or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 : 1
3. The electric state of a conductor that shows the transference of electricity from or to it.

4. It is the substance which takes away oxygen or gives hydrogen during a chemical reaction.
5. The hereditary trait that appears in all individuals of the first generation.

B Explain practical activity illustrating the effect of temperature on the rate (speed) of a chemical reaction.

C Use the following symbols [(R) for the dominant red and (r) for the recessive white] to express the results of mating between pure white flowers pea plant and pure red flowers pea plant. Explain the parents, the gametes and the first filial generation.

Additional questions

Put (✓) or (×) in front of the following statements :

1. The glucagon hormone is secreted by pituitary gland. ( )
2. The iron element shares in composing thyroxin hormone. ( )
3. The decrease in secretion of insulin hormone causes diabetes disease. ( )
4. Sodium carbonate is used in polishing silver. ( )

19 Sohag Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The speed of chemical reactions .... due to the increase of temperature.
2. Oxidation and reduction are two .... processes.
3. The .... effects of radiation are results of changing the sex chromosomes of the cells.
4. The ohmmeter is used to measure .... in the electric circuit.

B Give reasons for :

1. Gold does not react with acids.
2. Mendel chose the pea plant to conduct his experiments.

C 1. Calculate the e.m.f. for a battery consists of 3 cells, the e.m.f. for each cell is 1.5 volt when they are connected :

a. In series. b. In parallel.

2. Use the following symbols to express the results of mating between a short stemmed pea plant (tt) and a long stemmed pea plant (Tt).

Question 2

A Write the scientific term for each of the following statements :

1. A substance that increases the speed of the chemical reaction without interfering in it or being consumed.
2. The quantity of electric charges that flow through a conductor in a time of one second.
3. The traits that are not transmitted from one generation to another.
4. Parts of the DNA that are present on the chromosomes and carry the hereditary traits of the individual.

B Complete the following chemical equations :

1. $NaCl + AgNO_3 \longrightarrow$ .... + ...
2. $2Na + 2H_2O \longrightarrow$ .... + ... + heat
3. $CuCO_3 \xrightarrow{\Delta}$ .... + ...
4. .... $\xrightarrow{\Delta}$ 2Hg + ...$\uparrow$

C Calculate the potential difference between the two ends of a vacuum cleaner whose resistance is 22 ohm and the current intensity passing through it is 10 ampere.

Question 3

A Choose the correct answer :

1. Iron filings reacts with diluted hydrochloric acid faster than a piece of iron has the same mass due to the ....
   a. increase in concentration. b. presence of a catalyst.
   c. increase in surface area. d. no correct answer.
2. .... is a non-radioactive element.
   a. Radium b. Uranium c. Cesium d. Iron
3. The ability to roll the tongue is one of the .... traits in the human being.
   a. dominant b. recessive c. hybrid d. hermaphrodite
4. Covalent compounds are .... in their reactions.
   a. fast b. slow c. catalyst d. no correct answer

B Mention one function only for each of the following :

1. Rheostat. 2. Radioactive elements in medicine. 3. Ammeter.

C Write the balanced chemical equations for the following :

1. A metal substitutes the hydrogen of acid (using zinc).
2. A metal substitutes another metal in one of its salt solution (using magnesium).

PART 3

Question 4

A Place the mark (✓) or (×) in front of the following sentences and correct the mistakes :

1. Copper sulphate is decomposed by heat into black copper oxide and sulphur dioxide gas. ( )
2. To generate an alternating electric current, we use the coulomb. ( )
3. The two factors of a hereditary trait are similar in the hybrid individual. ( )
4. In the electric cell, the magnetic energy is converted into electric energy. ( )

B Define each of the following :

1. Ohm's law.
2. Mendel's first law.
3. Neutralization.
4. Rem.

C Calculate the quantity of electricity when an electric current of intensity 18 ampere passes for 7 minutes through a conductor.

Additional questions

A Define the catalytic converter and mention its importance.

B What would happen ..... ?

1. If the pancreas decreases its secretion of the insulin hormone.
2. When the glucose sugar level is increased in blood.
3. When the estrogen hormone doesn't secreted at adulthood stage in a female.

20 Qena Governorate

Answer the following questions :

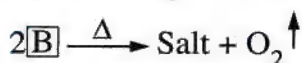
Question 1

A Complete the following statements :

1. The .... effects of radiation cause changes in the cells composition.
2. Mendel covered the stigmas of the flowers to prevent the .... pollination.
3. The .... apparatus is used to measure the electromotive force.
4. The potential difference between the two terminals of a conductor is .... proportional to the intensity of the electric current passing through it at a constant temperature.

B Study the following chemical reactions, then answer the following questions :

$\boxed{A} + AgNO_3 \longrightarrow$ Precipitate + $\boxed{B}$



$2\boxed{B} \xrightarrow{\Delta}$ Salt + $O_2 \uparrow$

1. Write the chemical formula for (A) and (B).
2. Mention the colour of the precipitate and the salt.

C Mention one use (one importance) for each of the following :

1. Sliding rheostat. 2. Genes.

Question 2

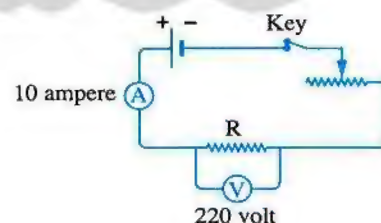
A Choose the correct answer :

1. At the end of the chemical reaction, the concentration of the reactants is .... %
   a. zero b. 50 c. 75 d. 100
2. The genetic structure of wrinkled yellow coloured seeds of a pea plant is ....
   a. yySS b. YYSS c. yyss d. YYss
3. In the electric cell, ... energy is converted into electric energy.
   a. magnetic b. kinetic c. chemical d. light
4. When passing hydrogen gas on hot black copper oxide, ... process occurs for copper oxide.
   a. oxidation b. reduction
   c. thermal decomposition d. (a) and (b) together
5. Which of the following traits is recessive in the human being ? ....
   a. Wide eyes. b. Black hair.
   c. Presence of dimples. d. Presence of freckles.

B What is meant by .... ?

1. The electric current. 2. Neutralization reaction.
3. The law of independent assortment of hereditary factors.

C In the opposite electric circuit, calculate :



1. The value of the electric resistance.
2. The quantity of electricity passing through the circuit in one minute.

Question 3

A Put (✓) or (×) in front of the following statements :

1. In positive catalytic reactions, catalyst is used to slow down the speed of the chemical reaction. ( )
2. The electromotive force (e.m.f.) of several cells connected in parallel equals the electromotive force (e.m.f.) of one cell. ( )

PART 3

3. The two factors of a hereditary trait are similar in the hybrid individual. ( )
4. The radioactivity phenomenon was discovered by the scientist Badel. ( )
5. Copper sulphate decomposes by heat into copper oxide and sulphur dioxide gas. ( )
6. The acquired traits are not transmitted from one generation to another. ( )

B Compare between :

1. Oxidizing agent and reducing agent (according to : the definition).
2. The direct current and alternating current (according to : the uses).

C What happens in the following cases ...... ?

1. The gene cannot produce its specific enzyme.
2. Putting a small piece of sodium in water.

Question 4

A Write the scientific term for each of the following statements :

1. The change in the concentration of the reactants and the resultants at a unit time.
2. The state of an electric conductor that shows the transfer of the electricity from or to it when it is connected to another conductor.
3. The appearance of a hereditary trait in the individuals of the first generation when two individuals are crossed, one of them carries a pure hereditary trait contrasting the trait carried by the other individual.
4. The measuring unit of the absorbed radiation.
5. The breaking up of bonds between the molecules of the reactants and formation of new bonds between the molecules of the products.

B Give reasons for :

1. The ability of rolling the tongue is dominant trait in the human being.
2. Magnesium substitutes copper in copper sulphate solution.
3. The area chosen for storing radioactive wastes should be steady.

C Using symbols to express the results of mating between white flowers pea plant and pure red flowers pea plant and mention the ratios of resulting offspring in the first generation and second generation.

Additional questions

Mention the role or the function of each of the following :

1. Mammary glands activating hormones.
2. Thyroid gland.
3. Iodine salt.
4. Sodium bicarbonate in the garden.

21 Luxor Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Electric cell produces .... current, while the electric generator (dynamo) produces .... current.
2. From the factors affecting the speed of the chemical reaction are .... and ....
3. The chromosome is chemically composed of a nucleic acid called .... which is combined with ....
4. In the chemical reaction, the concentration of the .... decreases and the concentration of the .... increases as the time passes.
5. The blood group is an example of .... traits, while the learning to walk in children is an example of .... traits.

B State the contribution (the role) of the following scientists :

1. Badel and Tatum.
2. Henri Becquerel.

C Calculate the quantity of electricity that passes in a conductor of a resistance 1000 ohm for 20 minutes when it is connected with a source of electric potential 220 volt.

Question 2

A Write the scientific term for each of the following statements :

1. It is the science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring.
2. It is the current intensity passing through a conductor whose resistance is one ohm and the potential difference across its terminals is one volt.
3. They are chemical substances produced by the body of living organism, act as catalysts that increase the speed of the biological reactions.
4. It is the individual that carries a similar pair of genes either dominant or recessive.
5. They are elements whose atoms nuclei contain a number of neutrons more than the number required for its stability.

B Write the balanced chemical equation for the following reactions :

1. Reaction of water with sodium.
2. Heating of copper hydroxide.
3. Reaction of dilute hydrochloric acid with sodium carbonate.

PART 3

C If crossing takes place between two pea plants, one of them with hybrid red flowers and the other with pure white flowers.
Explain on the genetic principles, the results of such crossing. Mention the characteristics and the ratio of the obtained offspring.

Question 3

A Choose the correct answer :

1. When sodium atom loses an electron from its outermost energy level, it becomes ....
   a. oxidized. b. reducing agent. c. reduced. d. (a) and (b) are correct.
2. The measuring unit of the absorbed radiation is the ....
   a. curie. b. rem. c. ohm. d. ampere.
3. Which of the following traits is dominant in human being ? ....
   a. Smooth hair. b. Absence of dimples.
   c. Wide eyes. d. Presence of freckles.
4. When magnesium replaces copper in its salt solution, a .... precipitate is formed.
   a. black b. green c. red d. no correct answer.
5. The value of the resistance of an electric conductor in an electric circuit is changed on changing the ....
   a. dimensions of the conductor.
   b. electric current intensity passing through it.
   c. quantity of electricity that passes through it.
   d. potential difference between its terminals.

B Mention one use or function for each of the following :

1. The genes. 2. The nuclear energy in agricultural field.
3. Manganese dioxide.

C Give reason for each of the following :

1. Mendel selected (chose) the pea plant to conduct his experiments.
2. Although aluminium comes before zinc in chemical activity series, but it takes a longer time to react with hydrochloric acid practically.

Question 4

A Put (✓) or (×), then correct what is wrong :

1. Mendel removed the stamens of pea plant flowers before the anther becomes mature during his experiments to prevent cross pollination with other flowers. ( )
2. The oxidizing agent (factor) is the substance which takes oxygen away or gives hydrogen during a chemical reaction. ( )

3. The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature. ( )
4. Mendel's second law is called the law of segregation of factors. ( )
5. Most metal sulphates decompose when they are heated to metal oxide and sulphur trioxide gas evolves. ( )

B What happens in the following cases ...... ?

1. Exposing of human body to a large dosage of radiation for a short time.
2. Adding silver nitrate solution to sodium chloride solution.

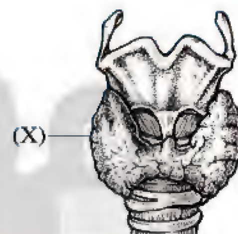
C You have 4 similar electric cells, the electromotive force of each one is 1.5 volt. Illustrate by drawing how you connect them to get batteries of e.m.f. :

a. 1.5 volt. b. 3 volt c. 6 volt.

Additional questions

A Mention the uses of sodium bicarbonate in the home.

B From the opposite fig., answer the following questions :



1. What is the name of the gland (X) ?
2. Mention the most important secretions of this gland.

22 Aswan Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The breaking up of bonds between the reactants molecules and formation of new bonds between the products molecules is called ....
2. The chromosome is chemically composed of a nucleic acid called .... which is combined with protein.
3. The .... apparatus is used for measuring the current intensity, and the .... apparatus is used to measure the resistance in the electric circuit.

B Use the following symbols to express the results of mating between a pure short stem pea plant (tt) and a pure tall stem pea plant (TT).

C Mention the uses of each of the following :

1. The alternating electric current.
2. The nuclear energy in the drilling field.

PART 3

Question 2

A Choose the correct answer :

1. At the beginning of the chemical reaction, the ratio of the reactants concentration equals ....
   a. 100% b. 50% c. 20% d. zero%
2. In dynamo, the .... energy is converted into the electric energy.
   a. magnetic b. kinetic c. chemical d. light
3. The measuring unit of the absorbed radiation is ....
   a. curie. b. ampere. c. roentgen. d. rem.
4. The two factors of a hereditary trait are similar in the .... individual.
   a. pure b. hybrid c. recessive d. (a) and (c) together

B Give reasons for :

1. The rate of the reaction of hydrochloric acid with iron filings is faster than a piece of iron has the same mass.
2. Uranium is considered from radioactive elements.

C If an electric current of 0.2 ampere passes through an electric heater and the potential difference between its two ends is 220 volt. Calculate the heater's resistance.

Question 3

A Write the scientific term for each of the following statements :

1. They are parts of DNA present on the chromosomes and control the hereditary traits of the individual.
2. Reaction between an acid and an alkali to form salt and water.
3. The radiation or nuclear energy emitted during nuclear reactions that can be controlled and carried out by nuclear reactors.
4. The state of a conductor that shows the transference of electricity from or to it, if it is connected to another conductor.

B Compare between heating of metal oxide and metal hydroxide.

C Chemical reactions are classified into different types.

Write the type of each reaction of the following :

1. $H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$
2. $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

Question 4

A Correct the underlined words in the following statements :

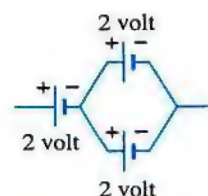
1. The **acquired** traits are transmitted from one generation to another.
2. The rate (speed) of chemical reaction is increased by **decreasing** the temperature.
3. The reactions of ionic compounds are **slower** than that of the covalent compounds.
4. The **attached** ear lobe is a dominant trait in human being.

B Define each of the following :

1. Chemical activity series.
2. Coulomb.

C By using the opposite figure :

Calculate the total electromotive force.



Additional questions

What is meant by ...... ?

1. Hormone disorder.
2. Simple goiter.
3. Gigantism.
4. Diabetes.

23 New Valley Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. The apparatus used to control the value of electric resistance in the electric circuit is the ....
   a. ohmmeter. b. rheostat. c. voltmeter.
2. The substance that changes the rate of the reaction without itself being changed is known as the ....
   a. oxidizing agent. b. reducing agent. c. catalyst.
3. .... is chemically composed of the nucleic acid DNA combined with protein.
   a. Cytoplasm b. Chromosome c. Gene
4. The measuring unit of the absorbed radiation is ....
   a. rem. b. roentgen. c. ampere.

PART 3

B **Write the balanced chemical equations for the following reactions :**

1. The reaction of hydrochloric acid with sodium hydroxide.
2. The decomposition of sodium nitrate by heat.
3. Reduction of hot copper oxide by hydrogen.

C **What happens when ... ?**

1. The atom nucleus of an element contains a number of neutrons more than the number required for its stability.
2. You keep food outside the refrigerator for a long time.
3. Two charged conductors touch and the electric potential of one conductor is 10 volt but the electric potential of the other conductor is 30 volt.

Question 2

A **Complete the following sentences :**

1. Dry cells produce .... current, while electric generators produce .... current.
2. Learning swimming is one of the .... traits, but the blood group is one of the .... traits.
3. A chemical reaction is the .... in the molecules of the reactants and formation of .... in the molecules of the resultants from the reaction.
4. One of the cellular effects of radiation is that a change happens in the .... like the change of chemical composition of ....

B **Give reasons for :**

1. On adding silver nitrate solution to sodium chloride solution, a white precipitate is formed.
2. The ability of bending the tongue is a dominant trait in human being.
3. The rate of the reaction in ionic compounds is more than the rate of the reaction in covalent compounds.

C **Calculate the quantity of electricity that passes in a conductor which has a resistance 2200 ohm for two minutes if the potential difference between its two terminals is 220 volt.**

Question 3

A **Write the scientific term for each of the following statements :**

1. A substance which loses one electron or more during a chemical reaction.
2. The spontaneous conversion of the nuclei of the atoms of some radioactive elements that are present in nature to achieve a more stable composition.
3. The amount of electric charges that flow through a conductor in one second.
4. An enzyme in sweet potato which helps to break up hydrogen peroxide.

B Write the physical quantity which is measured by each of the following units :

1. Joule/coulomb.
2. Coulomb/second.

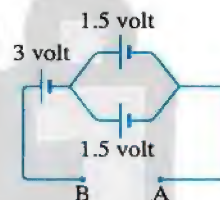
C Using the symbols to represent the results of copulation between pea plant with white flowers and another pea plant with red flowers.

Question 4

A Rewrite the following statements after correcting the underlined words :

1. Mendel's second law is known as the law of **segregation of factors**.
2. In the chemical activity series, the arrangement of the metals is in a descending order according to **their atomic weights** .
3. The **digestive system** is the first to be affected by the nuclear radiation.
4. The electric current intensity passing through a conductor is **inversely** proportional to the potential difference between its two ends when the temperature is constant.

B In the opposite figure, calculate the electromotive force (e.m.f.) between the two terminals (A) & (B).



C Scientists were interested in finding safe uses of the nuclear energy. Name the most important of these uses in the agriculture field, medicine field and drilling field.

Additional questions

Choose the correct answer :

1. The ceramic cells in the catalytic converter leads to ....
   a. increasing the surface area exposed to the reaction.
   b. increasing the concentration of the reactants.
   c. increasing the temperature.
   d. no correct answer.
2. Sodium bicarbonate is used in polishing silver by using a piece of .... during washing.
   a. copper foil b. zinc foil c. aluminium foil d. chrome foil
3. .... element shares in composing thyroxin hormone.
   a. Iodine b. Iron c. Sodium c. No correct answer

24 South Sinai Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The alternating electric current has variable intensity and ....
2. Mendel removed the stamens from the flowers of the plants to prevent .... pollination, while he covered the stigmas of the flowers to prevent .... pollination.
3. The ohmmeter instrument is used to measure .... in electric circuit.
4. $2Al + 6HCl \longrightarrow$ .... $+ 3H_2\uparrow$

B Mention the importance of each of the following :

1. The nuclear energy in the medical field.
2. The catalyst in chemical reactions.

C Calculate the quantity of electricity due to the flow of electric current has 18 ampere for 5 minutes.

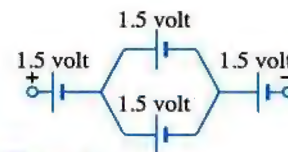
Question 2

A Write the scientific term for each of the following statements :

1. The chemical reaction in which the compound decomposes by heat into simpler components.
2. The flow of electric negative charges in a conducting substance (as a metal wire).
3. The change in the concentration of the reactants and products at a unit time.
4. They are parts of DNA present on the chromosomes and control the hereditary traits of the individual.

B From the opposite figure :

Calculate the electromotive force (e.m.f.) of the battery.



C Show by symbolic balanced chemical equations the following reactions :

1. The effect of heat on sodium nitrate.
2. The reaction of water with sodium.

Question 3

A Choose the correct answer :

1. If an electric current has 0.2 ampere passes through an electric heater and the potential difference between its terminals equals 220 volt, so the heater resistance equals .... ohm.
   a. 20 b. 1000 c. 1100 d. 2200
2. The reaction between silver nitrate and sodium chloride is from .... reactions.
   a. fast b. intermediate c. slow d. very slow
3. From the dominant traits in the human being is .... trait.
   a. straight hair b. attached ear lobe c. narrow eyes d. absence of freckles
4. From non-radioactive elements is ....
   a. radium. b. uranium. c. cesium. d. iron.

B In the following reaction losing and gaining electrons take place, determine the oxidizing agent and reducing agent and mention the reason.

$$2Na + Cl_2 \longrightarrow 2NaCl$$

[Knowing that the atomic number of sodium (Na) equals 11 and chlorine (Cl) equals 17].

C The radiation has genetic effects. Explain this statement practically.

Question 4

A Correct the underlined words for the following :

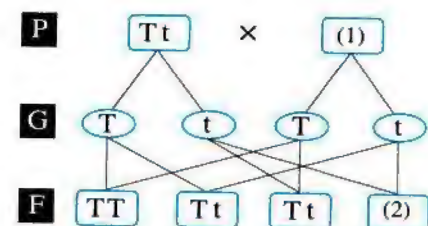
1. Most metal carbonates decompose by heat into **metal** and carbon dioxide.
2. The measuring unit of electromotive force is **coulomb**.
3. Mendel's second law is known as the law of **segregation of factors**.
4. The dynamo (electric generator) converts the **light** energy into electric energy.

B Give reasons for the following :

1. The rate of the reaction of hydrochloric acid with iron filings is faster than a piece of iron has the same mass.
2. The sliding rheostat is used in some electric circuits.

C In the opposite figure, a self pollination takes place in hybrid pea plant with tall stem :

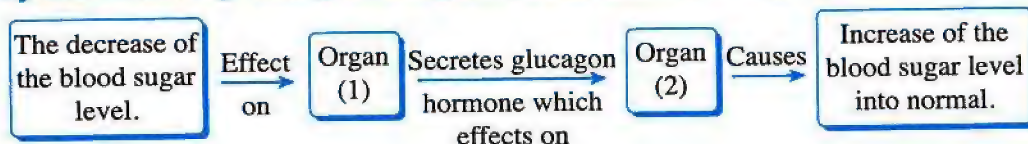
Replace the numbers (1 & 2) with suitable symbols.



PART 3

Additional questions

A Study the following biological diagram, then answer the questions :



a. What is the name of organ (1) ?

b. What is the name of organ (2) ?

B What is the importance of air bags ?

25 Red Sea Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. On connecting two charged conductors, the electric current passes from the conductor with .... potential to the conductor which has .... potential.
2. During Mendel's experiments, he removed the stamens from the flowers to prevent .... pollination, and he covered the stigmas of flowers to prevent .... pollination.
3. $2HgO \xrightarrow{\Delta}$ .... + ...
4. When sodium atom ($_{11}Na$) combines with chlorine atom ($_{17}Cl$), ... is considered as an oxidizing agent, while .... is considered as a reducing agent.
5. The electric current intensity passing through a conductor is .... proportional to the resistance of a conductor and .... proportional to the potential difference between the two terminals of a conductor.

B What happens when ..... ?

1. Putting two effervescent tablets in two beakers, one of them contains cold water and the other contains hot water.
2. Exposing a man for a large dosage of atomic radiation for a short period of time.
3. Heating the solution resulting from the reaction between hydrochloric acid and sodium hydroxide.

C Mention one use or function for each of the following :

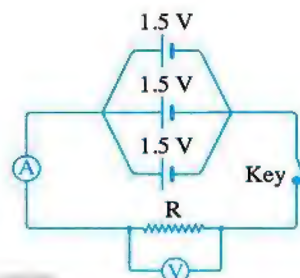
1. Ohmmeter.
2. Nuclear energy in agricultural field.

Question 2

A Give reasons for :

1. The speed of chemical reaction increases when the concentration of the reactants increases.
2. The ability of rolling the tongue is dominant trait in the human.
3. Some electric cells are connected in the electric circuit in series.
4. A red precipitate is formed when magnesium is added to copper sulphate solution. (write the balanced chemical equation).

B From the opposite electric circuit :



If a quantity of electricity which passes through the electric circuit in a time 40 second is 20 coulomb.

Find : 1. The ammeter reading.
2. The voltmeter reading.
3. The value of the resistance (R).

C Using the symbols (T , t) to express the results of mating between two pea plants, both of them have hybrid tall stem. Showing :

(parents – gametes – ratio of the offspring)

Question 3

A Write the scientific term for each of the following :

1. The enzyme which is found in sweet potato and accelerates the decomposition rate of hydrogen peroxide.
2. The process of spontaneous decaying of atoms of some elements present in nature to reach a more stable composition.
3. Parts of DNA that are present on the chromosomes and control the hereditary traits of the individual.
4. A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage.

B Correct the underlined words for the following :

1. The reactions of ionic compounds are **slower** than that of covalent compounds.
2. Most metal sulphates decompose by heating into metal oxide and **nitrogen** gas.
3. The atom's **proton** is considered as the energy store.
4. Mendel's second law is called the law of **segregation of factors**.

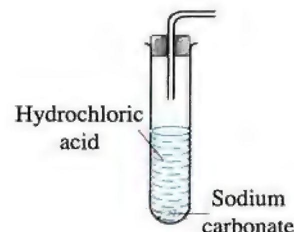
PART 3

C Compare between :

The direct electric current and the alternating electric current according to :
(Source – Graphical representation)

Question 4

A From the opposite figure :



1. a. What is the name of the evolved gas from the reaction ?
   b. How do you discover it ?
2. a. Write the balanced chemical equation for the reaction.
   b. What is the type of the reaction ?

B Choose the correct answer :

1. The measuring unit of the absorbed radiation is the ....
   a. joule. b. rem. c. ohm. d. volt.
2. The physical quantity which its measuring unit equivalent (joule/volt. second) is ....
   a. current intensity. b. potential difference.
   c. work done. d. quantity of electricity.
3. On adding silver nitrate solution to sodium chloride solution, a .... precipitate is formed.
   a. red b. black c. blue d. white
4. The two scientists .... discovered how do the genes perform their functions.
   a. Watson and Crick b. Badel and Crick
   c. Badel and Tatum d. Watson and Becquerel
5. All of the following metals replace hydrogen of an acid except ....
   a. Sn b. Au c. Zn d. Al

C What is meant by ...... ?

1. Acquired traits.
2. The potential difference across two terminals of a conductor is 5 volt.

Additional questions

Mention the disease or the disorder results due to :

1. The decrease in the growth hormone secretion at childhood stage.
2. The increase in the growth hormone secretion at childhood stage.
3. The insulin hormone deficiency.

26 Matrouh Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. Sodium reacts with water giving .... and .... gas evolves.
2. The catalyst changes the speed of the reaction but don't affect either its .... or ....
3. Volt = $\frac{\text{Joule}}{\dots\dots \times \dots\dots}$
4. Nuclear energy can be used in agricultural field to .... and to improve ....
5. Every gene gives a special .... which is responsible for occurrence of a chemical reaction resulting in .... showing a specific hereditary trait.

B In a pea plant, what are the results of self-pollination of hybrid tall plant by using the symbols (T , t) showing (parents, gametes, offspring). Mention the ratio of the resulted generation.

C Show by balanced chemical equations each of the following :

1. Heating of copper sulphate.
2. Adding hydrochloric acid to sodium carbonate.

Question 2

A Choose the correct answer :

1. If an electric current whose intensity is one ampere passes through a resistance of 20 ohm, then the intensity of the electric current increases to 2 ampere in the same resistance, so the value of the resistance ....
   a. increases to double. b. decreases to half.
   c. decreases to quarter. d. does not change.
2. The reaction between silver nitrate solution and sodium chloride solution is .... reaction.
   a. fast b. slow c. very slow d. average
3. When a short stemmed, white flowered pea plant is cross pollinated with a long stemmed, red flowered pea plant so, plants of 1^{st} generation are ....
   a. long stemmed & white flowered. b. long stemmed & red flowered.
   c. short stemmed & white flowered. d. short stemmed & red flowered.
4. Sodium metal can replace all of the following metals from their salt solutions except ....
   a. copper. b. potassium. c. magnesium. d. zinc.

PART 3

5. In dynamo, ... energy is converted into electric energy.

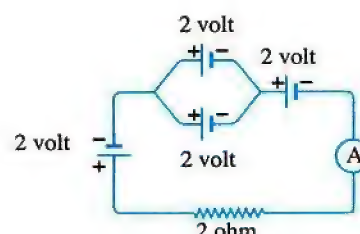
a. magnetic b. kinetic c. chemical d. light

B What happens when ...?

1. A human body is exposed to a large dosage of radiation for a short time.
2. Two conductors having the same electric potential are connected together by a wire.

C In the opposite electric circuit :

Calculate the reading of the ammeter.



Question 3

A Give reasons for :

1. The nuclei of radioactive elements are unstable.
2. Burning of the steel scourers used for cleaning aluminium in a jar full of oxygen is faster than its burning in atmospheric air.
3. Mendel removed the stamens from the flowers of the plants before the anther becomes mature.
4. The voltmeter is connected between the two poles of battery.

B Put (✓) or (×), then correct what is wrong :

1. Genes are parts of DNA found in the cytoplasm of the cell. ( )
2. Ohmmeter is used to control the electric resistance in the electric circuit. ( )
3. Aluminium reacts with diluted hydrochloric acid faster than the reaction of zinc with the same acid. ( )
4. In the reaction : $H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$ Hydrogen is an oxidizing agent. ( )

C Mention one of the most important efforts of the following scientists :

1. Watson and Crick. 2. Henri Becquerel.

Question 4

A Write the scientific term for each of the following statements :

1. The change in the concentration of the reactants and resultants in a unit time.
2. The ratio between the potential difference across the two ends of a conductor and the electric current intensity passing through it.
3. They are changes that appear on a living organism as a result of exposure to radiation.
4. They are the traits that are transmitted from one generation to another.
5. A chemical process where the atom loses an electron or more.

B **Draw and write down labels to represent each of the following :**

1. The electric circuit that is used to verify Ohm's law.
2. Graphic representation of the alternating current.

C **What is meant by ..... ?**

1. Potential difference.
2. The direct electric current.
3. Chemical reaction.

Additional questions

A **What would happen when man takes a little amount of iodine in his food ?**

B **Mention the role or function of pancreas gland.**

C **Write a short note about the uses of sodium bicarbonate in the garden.**

Final Examinations 2017

1 Cairo Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The .... is used to measure the electromotive force of the battery in measuring unit called ....
2. When magnesium replaces copper in its salt solution, a precipitate its colour is .... is formed.
3. When glucose level is increased in blood, the pancreas secretes .... hormone.

B Define each of the following :

1. The alternating electric current. (mention its uses)
2. The law of independent assortment of hereditary factors.
3. The speed of chemical reaction.

C Calculate the quantity of electricity that passes through a conductor of a resistance 2200 ohm for 30 minutes if the potential difference between its terminals is 220 volt.

Question 2

A Choose the correct answer :

1. The .... hormone liberates the energy necessary for the body from food.
   a. growth b. estrogen c. thyroxin d. glucagon
2. Active metals substitute hydrogen of water and produce metal hydroxide and .... gas evolves.
   a. N_2 b. O_2 c. H_2 d. CO_2
3. The two factors of a hereditary trait are similar in the .... individual.
   a. pure b. hybrid c. recessive d. (a) and (c)
4. The most active metal in the chemical activity series is ....
   a. copper. b. sodium. c. hydrogen. d. aluminium.
5. The .... is used to control the resistance in the electric circuit.
   a. rheostat b. ammeter c. voltmeter d. ohmmeter

B From the opposite reaction : $2Na + Cl_2 \longrightarrow 2NaCl$

Explain oxidation and reduction processes.

[If you know that the atomic number of Na is (11) and Cl is (17)]

C Explain on genetic bases the properties of the generation produced from self-pollination in a pea plant that has a hybrid yellow seeds. [knowing that the dominant gene is symbolized by (Y) and the recessive one is symbolized by (y)]. Mention the ratio of the produced individual.

Question 3

A Write the scientific term :

1. The opposition that the electric current faces during its passage through a conductor.
2. Organs secrete hormones directly in the blood stream.
3. The charge transferred by a constant current of intensity one ampere in one second.
4. It is a chemical reaction where the double substitution occurs between the ions of two compounds to form two new compounds.

B Compare between :

The two testes and the two ovaries (according to : function).

C Give reasons for :

1. Uranium is considered from radioactive elements.
2. The combustion of steel scourers used for cleaning aluminium in a jar contains oxygen is faster than its combustion in the air.
3. The ability to roll the tongue is one of the dominant traits in the human being.

Question 4

A Re-write the following statements after correcting the underlined words :

1. The reactions of covalent compounds are **faster** than that of ionic compounds.
2. The **glucagon** hormone controls the calcium level in the blood.
3. The nucleus of each cell carry a complete group of **hormones** which are responsible for the appearance of the hereditary traits in living organisms.
4. A person becomes giant on increasing the secretion of **testosterone** hormone at the childhood stage.

B What would happen when ... ?

1. Heating of red mercuric oxide (Illustrate by balanced symbolic equation).
2. Touching two charged conductors by a conducting bar, the first conductor has an electric potential is equal to the electric potential of the second one.

C You have four similar cells, the e.m.f. for each cell is 1.2 volt. Explain by using diagrams how you can connect them to obtain a battery of e.m.f. 2.4 volt with two different ways.

PART 3

2 Giza Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. NaOH + ... ⟶ NaCl + H_2O
2. The radioactivity phenomenon was discovered by .... scientist.
3. When the amount of glucose decreases in the blood, pancreas secretes .... hormone.
4. In the electric cell, ... energy is converted into electric energy.

B Compare between :

The direct current and the alternating current (in view of definition).

C Using symbols to express the results of mating between white flower pea plant and the other red flower plant. Mention the ratio of the produced individuals.

Question 2

A Choose the correct answer :

1. To control the value of the electric resistance in the electric circuit, we use .... instrument.
   a. ohmmeter b. rheostat c. voltmeter
2. The .... is chemically composed of the nucleic acid DNA combined with protein.
   a. cytoplasm b. gene c. chromosome
3. The hormone whose deficiency causes the enlargement of the thyroid gland is ....
   a. estrogen. b. thyroxin. c. insulin.

B Mention one importance for : Adrenalin hormone.

C Calculate the potential difference between the two ends of a conductor, whose resistance is 22 ohm and the current intensity is 10 ampere.

Question 3

A Write the scientific term :

1. The flow of electric negative charges through a conducting material.
2. The trait that appears in all individuals of the first generation in Mendel's experiments.
3. Organs secrete hormones directly into blood stream.
4. A substance which changes the rate of chemical reaction without being changed.

B What happens if ... ?

1. The stigma of the flower of pea plant uncovered during the study of the inherited traits.
2. Heating blue copper hydroxide.

C You have three similar cells, the electromotive force of each is 1.5 volt. Explain by drawing how can you get :

1. A battery of e.m.f. (1.5 volt).
2. A battery of e.m.f. (4.5 volt).

Question 4

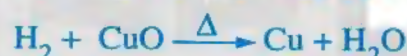
A Correct the underlined words :

1. Rate (speed) of chemical reaction is increased by **decreasing** the temperature.
2. **Attached** ear lobe is one of the dominant trait in human being.
3. The hormone which regulates the level of calcium in the blood is the **insulin** hormone.

B Give reasons for :

1. The rate of chemical reaction is increased by increasing the reactants concentration.
2. The areas chosen for storing radioactive wastes should be steady.

C In the following reaction, determine the oxidizing agent and the reducing agent.



$$H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$$

3 Alexandria Governorate

Answer the following questions :

Question 1

A Write the scientific term for the following :

1. The quantity of electricity in coulomb that flows through a cross-section of a conductor in one second.
2. The hormone that controls the speed rate of muscles and bones growth.
3. The substance which loses one electron or more during a chemical reaction.

B Write the symbolic balanced equations for the following :

1. The reaction of sodium with water.
2. Breaking down of nitrogen pentoxide gas.

C Illustrate briefly how the gene does its function.

Question 2

A Correct the underlined parts in the following :

1. The ionic compounds are fast in their reactions, because they decompose into **molecules** that easy share in the reaction.
2. Mendel removed the **petals** from the flowers of pea plant to prevent the self-pollination.
3. On decreasing of sugar level in the blood, the **liver** responds by secreting glucagon hormone.

PART 3

B Compare between the exophthalmic goiter and diabetes concerning the reason and the symptoms.

C Mention one use or function for each of the following :

1. The nuclear energy in medicine.
2. Testosterone hormone.

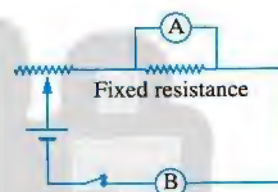
Question 3

A Complete the following :

1. Transmission of electric charges depends on the .... between two conductors.
2. Breaking down the bonds between the molecules of the reactants and formation of new bonds between the molecules of products is called ....
3. The thyroid gland secretes .... hormone that regulates the calcium level in the blood.
4. Henri Becquerel discovered the emission of an unseen rays from .... element.

B What is meant by the hormone ?

C From the opposite electric circuit,complete :



1. The instrument Ⓐ represents .... that measures ....
2. The instrument Ⓑ represents .... that is connected in the circuit in ....

Question 4

A Choose the right answer :

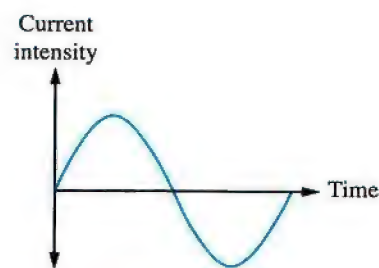
1. Thermal decomposition of copper carbonate gives ....
   a. copper + water.
   b. copper + carbon dioxide.
   c. copper oxide + carbon dioxide.
   d. copper oxide + water vapour.
2. The recessive trait appears on one of the sons if he inherited .... from the parents.
   a. two dominant genes
   b. only one dominant gene
   c. two recessive genes
   d. a recessive gene and a dominant gene
3. From the examples of electrochemical cells is the ....
   a. dry cell.
   b. dynamo.
   c. rheostat.
   d. ohmmeter.

B The pea plant that has tall or short stems also it has red or white flowers. If (T) represents the tallness of stem and (R) represents the red colour of flowers, so what is the genetic structure of the following :

1. Hybrid tall stemmed and red flowered plant.
2. Short stemmed and white flowered plant.

C Give reasons for :

1. The opposite graph represents the alternating current.
2. On adding hydrochloric acid to aluminium, the reaction happens after a short time.



4 El-Kalyoubia Governorate

Answer the following questions :

Question 1

A Write the scientific term :

1. A chemical substance that controls and organizes most of the vital activities and functions.
2. A type of the chemical reaction which involves the breaking up of the compound into simple elements by the effect of heat.
3. The process of spontaneous decaying of atoms nuclei of some radioactive elements that are present in nature.
4. The electric current that is produced from converting the mechanical energy into electric energy by means of the dynamo.

B Give reasons for :

1. If the electric current intensity passing through a conductor increases, then the potential difference across its terminal increases.
2. The rate (speed) of chemical reaction increases by increasing temperature.

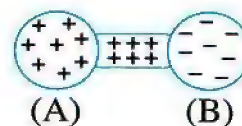
C Illustrate by balanced chemical equations the following reactions :

1. The reaction of sodium hydroxide with hydrochloric acid.
2. The effect of heat on copper sulphate.

Question 2

A What happens when ... ?

1. In the opposite figure, the electric potential at point (A) is equal to the electric potential at point (B) [according to the flow of the electric current through the conductor (A B)].



2. Lack of iodine from food.
3. A substance gains an electron or more during a chemical reaction.

PART 3

B **If crossing takes place between two pea plants, one of them with yellow seeds and the other with green seeds, this crossing produced 50% yellow seeds and 50% green seeds. Explain on genetic principles :**

– The genetic structure of parents.

– The gametes forming the first generation.

– The genetic structure of the produced generation.

Question 3

A **Choose the correct answer :**

1. From the dominant traits in the human being is ....
   a. smooth hair. b. wide eyes. c. absence of dimples. d. presence of freckles.
2. The active metals can replace the hydrogen of water which evolves and produce ....
   a. metal hydroxide. b. metal oxide. c. metal carbonate. d. metal sulphate.
3. During the reaction between hydrogen and black copper oxide, ... process occurs for copper oxide.
   a. oxidation b. reduction
   c. oxidation and reduction d. no correct answer
4. The amount of electricity is measured by ....
   a. volt. b. ampere. c. volt/ampere. d. ampere × second.

B **Mention three ways of protection from radiation pollution.**

C **You have four similar electric cells and the electromotive force of each one is 1.2 volt illustrate by drawing only how you connect them to get batteries of electromotive force of :**

1. 1.2 volt. 2. 2.4 volt.

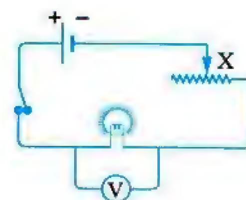
Question 4

A **Compare between each of the following :**

1. Estrogen hormone and testosterone hormone (according to : the function of each one).
2. Direct current and alternating current (according to : the uses of each one).
3. Oxidation and reduction (according to : the definition of each one).
4. Dwarfism and gigantism (according to : the reason of occurrence of each one).

B **Mention without explanation three factors affecting the speed of a chemical reaction.**

C The opposite figure represents an electric circuit which contains a lamp, the resistance of its filament is (10) ohm. If the electric current intensity passes through the lamp increases more than (0.1) ampere, its filament melts, answer the following questions :



1. Does the filament melt or not when passing an electric current in the circuit ? Why ? if you know that the reading of the voltmeter which is connected to it on parallel is (5) volt.
2. What is the name of the part (X) ? And what is its function ?

5 El-Sharkia Governorate

Answer the following questions :

Question 1

A Complete the following statements with suitable words :

1. .... hormone is responsible for female secondary sex characters.
2. $Na_2CO_3 + 2HCl \longrightarrow$ .... + H_2O + ...
3. The .... is used to measure the electric resistance in units known as ....
4. Electrochemical cells convert .... energy into .... energy.

B What would happen ... ?

1. When pancreas does not secrete glucagon hormone.
2. If the length of the rheostat wire increases (Related to the electric current intensity).
3. When adding a negative catalyst to a rapid reaction.

C Use the following symbols to express the results of mating between two pea plants both of them are yellow hybrid seeds (Yy).

Question 2

A Write the scientific term for each of the following statements :

1. They are parts of DNA present on the chromosomes and control the hereditary traits of the individual.
2. The measuring unit of the absorbed radiation.
3. The result when one of the endocrine glands does not work properly.
4. A chemical compound which is resulted from the reaction of acid with alkali.
5. The breaking up of bonds in molecules of the reactants and formation of new bonds in the molecules of resultants (products).

B Give a reason for :

Gold does not react with diluted acids.

PART 3

C Compare between :

1. Calcitonin hormone and progesterone hormone (according to : function only).
2. Covalent compounds and ionic compounds.

Question 3

A Correct the underlined words :

1. When we add silver nitrate solution to sodium chloride solution, a white precipitate of **sodium nitrate** is formed.
2. **Mendeleev** is considered as the founder of heredity.
3. The **iron element** shares in composing thyroxin hormone.
4. The radioactivity phenomenon was discovered by the scientist **Ohm**.
5. $Fe + 2HCl \xrightarrow{dil.} \mathbf{Fe_2Cl_3} + H_2 \uparrow$

B What is meant by each of the following ... ?

1. Pure individual.
2. Rem.

Question 4

A Choose the correct answer :

1. At the beginning of the reaction, the ratio of the reactants concentration equals ....
   a. 100% b. 0% c. 50% d. no correct answer.
2. .... is chemically composed of the nucleic acid DNA combined with protein.
   a. Cytoplasm b. Chromosome c. Gene d. Nucleus
3. The two factors of a hereditary trait are different in the .... individual.
   a. dominant pure b. recessive
   c. hybrid d. dominant pure and recessive
4. .... is a non-radioactive element.
   a. Radium b. Uranium c. Zerconium d. Iron

B If the potential difference between two ends of a conductor is 6 volt and the electric current intensity passing in the conductor is 0.5 ampere.

What is the electric current intensity passing in this conductor if it is connected by an electric source, its electric potential is 12 volt ?

C What is the importance of ... ?

1. Human genome project.
2. Pituitary gland.

1 Cairo Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. Neutralization is the reaction between an acid and an alkali to form .... and water.
2. Wide eyes is from the .... traits in the human being.
3. .... gland secretes hormone that regulates the growth of the human body.
4. $Fe + 2HCl \xrightarrow{dil.}$ .... + ...
5. Mendel's 1^{st} law is called the law of ....

B What is meant by ... ?

1. The electric potential of a conductor.
2. Chemical activity series.

C Calculate the electric current intensity that flows through a cross-section of a wire if a charge of 2400 coulombs passes through it in 4 minutes.

Question 2

A Choose the correct answer :

1. The hormone responsible for the appearance of secondary sexual male characters is the ....
   a. progesterone. b. testosterone. c. estrogen. d. glucagon.
2. At the beginning of the chemical reaction the percentage of the reactants concentration equals ....
   a. 50% b. zero % c. 100% d. 25%
3. .... is used to control the value of resistance in the electric circuit.
   a. Ammeter b. Voltmeter c. Ohmmeter d. Rheostat
4. Oxygen gas evolved by the thermal decomposition of ....
   a. $NaNO_3$ b. $Cu(OH)_2$ c. $CuSO_4$ d. $CuCO_3$
5. The electric current intensity resulting when a charge of one coulomb passes through a given cross-section in one second is called ....
   a. volt. b. ampere. c. coulomb. d. ohm.

B **Give reasons for :**

1. The speed of chemical reaction increases by increasing the temperature.
2. It is better to use the alternative current rather than the direct current.

C **Explain** on genetic principles the genetic structure of produced generation, if crossing takes place between two pea plants one of them with pure yellow seeds (YY) and the other with pure green seeds (yy). (If you know that the dominant is yellow)

Question 3

A **Write the scientific term of each of the following statements :**

1. Substances which speed up the chemical reaction without changing or being used up.
2. It is chemically consisted of nucleic acid called DNA bind with the protein.
3. It is the measuring unit of the absorbed radiation by the human body.
4. Special organs that secrete their hormones directly in the blood stream in human body.
5. A chemical process in which oxygen decreases in a substances.
6. It is the trait that appears in all individuals of the first generation in Mendel's experiment.

B **What happens when ... ?**

1. Adding silver nitrate solution to sodium chloride solution.
2. Decreasing the glucose level in blood.

C **A battery consists of three electric cells, the e.m.f. for each is (1.5 Volt.) Calculate the total e.m.f. if they connect in :**

1. Series connection.
2. Parallel connection.

Question 4

A **Rewrite the following statements after correcting the underlined words :**

1. Ammeter is a device used to measure the electromotive force.
2. The increase in secretion of calcitonin hormone leads to exophthalmic goiter disease.
3. The radioactive elements' nuclei contain a number of protons more than the number required for stability.
4. Hereditary traits that aren't transmitted from one generation to another.
5. Pure individual carries one dominant gene and other is recessive.
6. Reducing agent is the substance which gains an electron or more during a chemical reaction.

B Illustrate by balanced chemical equation :

1. Adding magnesium to copper sulphur solution.
2. The reaction of sodium with water.

C Compare between :

The electric cell & dynamo.

(regarding the change of energy in each)

2 Giza Governorate

Answer the following questions :

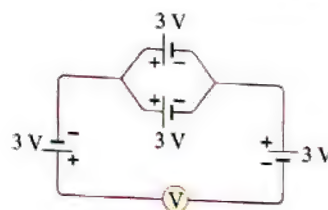
Question 1

A Put the suitable word in the missing parts in the following sentences :

(9 – DNA – recessive – Joule – 12)

1. The work done is measured by ....
2. The blue coloured and narrow eyes in the human are .... hereditary traits.
3. The chromosome, chemically consists of a nucleic acid called .... , which combined with protein.
4. **In the opposite figure :**

   The reading of voltmeter = ... volt.



B Put (✓) or (✗) in the front of the following statements :

1. Pancreas is a double function gland. ( )
2. The reaction : $Cl_2 + 2e^- \longrightarrow 2Cl^-$, represents oxidation process. ( )
3. Calcitonin hormone is control the level of calcium in the blood. ( )
4. The reactions of the covalent compounds are slow. ( )

C What is meant by ... ?

The electromotive force of an electric cell = 1.5 volt.

Question 2

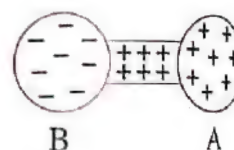
A Write the scientific term of each of the following statements :

1. The catalyst which is used to decrease the rate of the chemical reactions.
2. It is the spontaneous decay of the atoms' nuclei of some radioactive elements that are present in nature, in an attempt to achieve a more stable composition.
3. The method which is used in a connection of the electric cells to obtain a high electromotive force (e.m.f).
4. A chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance.

B **Choose the correct answer :**

1. On crossing male and female, their genotype (Bb), so the genotype (BB) is produced in their offspring at percentage of ....
   a. 25%   b. 50%   c. 75%   d. 100%
2. Copper carbonate is decomposed by heating into copper oxide and .... gas evolves.
   a. carbon dioxide   b. sulphur dioxide   c. sulphur trioxide   d. hydrogen
3. According to chemical activity series (C.A.S) the aluminium element is more active than .... element.
   a. sodium   b. potassium   c. zinc   d. calcium
4. According to Mendel's first law, the hereditary factors are .... when the gametes are formed.
   a. doubled   b. combine   c. segregate   d. disappear

C **In the opposite figure :**



What happen when we connect the two conductors, (A) and (B) which are equal in the electric potential, according to the flow of the electric current.

Question 3

A **Correct the underlined words :**

1. The secretion of <u>thyroxin</u> hormone is increased in fear, anger and emotion.
2. The measuring unit of absorbed nuclear radiation is <u>roentgen</u>.
3. It is responsible for secrete testosterone hormone is <u>pituitary gland</u>.
4. The current intensity due to the flow of 4500 coulomb through a cross-section of a conductor in 5 minutes equals <u>20</u> ampere.

B **Complete the following sentences by the suitable words :**

1. According to the law of independent assortment of hereditary factors of Mendel, the dominant trait appears in the second generation at a percentage of ....
2. $NaCl + AgNO_3 \longrightarrow$ ....$\downarrow$ $+ NaNO_3$
3. Mendel removed the .... of pea plant's flower to avoid a self pollination.
4. The speed of reactions of cooking food increases by ....

C **What happen when ... ?**

Placing a piece of magnesium ribbon in a solution of blue copper sulphate ? Write the balanced chemical equation which represent this reaction.

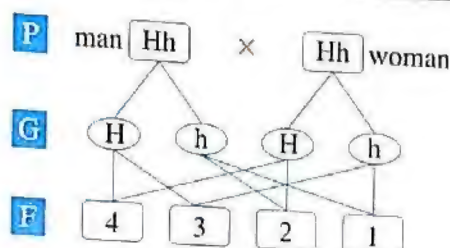
Question 4

A Choose from column (B), what suit it in column (A) :

(A)	(B)
1. Neutralization reaction	a. it is a process which converts a substance to another substance.
2. Electric dry cells	b. it is an electric current with variable intensity and direction.
3. Chemical reaction	c. it is a reaction between an acid and a base to form salt and water.
4. The alternating electric current	d. transfer the chemical energy into electric energy.

B According to your studding answer the following :

1. The opposite figure represents the inheritance of one of humans traits, what is the number of the child that carries the recessive trait ?



2. The potential difference between the two ends (terminals) of electric apparatus, which its resistance equals 22 ohm, and electric current intensity passes through it equals 10 ampere = ... volt.
3. The .... apparatus is used to measure the electric resistance in the electrical circuits.
4. On crossing pea plant of smooth hybrid seeds with another which wrinkled seeds it produces ....

C Give a reason for :

Forming of silvery colour on heating red mercuric oxide, write the balanced equation of the reaction.

3 Alexandria Governorate

Answer the following questions :

Question 1

A Complete the following statements :

1. The spontaneous decaying of the atoms' .... of some radioactive elements to be more stable elements is known as ....
2. The speed of chemical reaction is considered as the change in the .... of the reactants and resultants at a unit of time.
3. The Mendelian hereditary trait in the living organism is controlled by one pair of ....

B **What are the results in the following cases ... ?**

1. Adding dilute hydrochloric acid to sodium carbonate.

(Illustrate by the symbolic equation only)

2. The human body cells are unable to use glucose.

C **Choose from column (B), what suits statements in column (A) :**

(A)	(B)
1. The sliding rheostat.	a. the flow of electric negative charges in a conducting substance.
2. Oxidase enzyme.	b. control the resistance that the electric current faces on passing through wire.
3. The chemical reaction.	c. the quantity of electric charges that flows through a cross-section of the conductor in one second.
4. The current intensity.	d. increasing the decomposition of hydrogen peroxide solution.
	e. the breaking up of bonds in the reactants molecules and the formation of new bonds in the products molecules.

Question 2

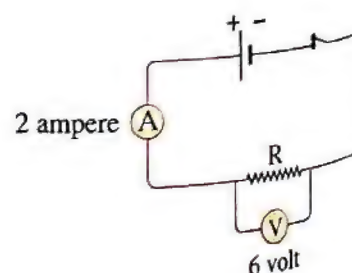
A **Write the scientific term of each of the following statements :**

1. The arrangement of the metallic elements in a descending order according to the degree of their chemical activity.
2. The hormone that is responsible for growing of the endometrium.
3. The value of the work done to transfer a quantity of electric charges of one coulomb between the two poles of a conductor.
4. Compounds their reactions are slow and occur between the molecules.

B **In the human, the trait of free ear lobe (E) dominates the trait of attached ear lobe (e) trait. What will be the result of marriage of a man and a woman both are hybrid. Show this case on genetic bases.**

C **Look at the opposite figure, then calculate :**

1. The value of resistance (R).
2. The quantity of electricity passing through the circuit at a half minute.

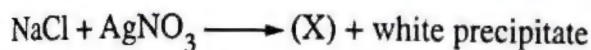


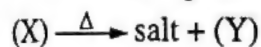
Question 3

A Choose the correct answer :

1. The .... generates direct current.
   a. dry cell   b. ohmmeter   c. voltmeter   d. ammeter
2. Mendel chose the pea plant to conduct his experiments for all the following reasons except ....
   a. the plant can be artificially pollinated.   b. the short life cycle of the plant.
   c. the big size of the plant.   d. the flowers are hermaphrodite.
3. From the properties of the alternating current is ....
   a. constant intensity.   b. constant direction.
   c. can not be transferred.   d. variable intensity and direction.
4. The chromosome is chemically consisted of nucleic acid (DNA) combined with the ....
   a. vitamins.   b. protein.   c. fats.   d. carbohydrates.

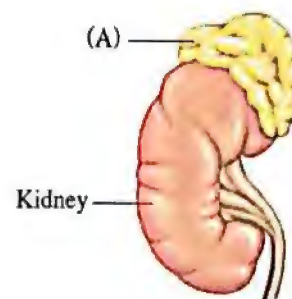
B Study both equations and answer the following :





1. Write the chemical formula for (X) and (Y).
2. Mention the type of reaction in each equation.

C Look at the opposite figure and answer :



1. What is the name of (A) gland ?
2. Mention the function of the hormone which the (A) gland secretes.

Question 4

A Correct the underlined words :

1. The dynamo is used to convert the **chemical** energy into electric energy.
2. Most metal carbonates are decomposed by heat into **metal** and carbon dioxide.
3. The hereditary traits are found inside **cytoplasm** of the cell of the living organism.
4. Cosmic radiation is considered as **artificial** source of radiation pollution.

B Give reasons for each of the following :

1. The fridge is used to preserve food.
2. Some electric cells are connected in parallel in electric circuit.

C What is meant by ...?

1. Reducing agent.   2. Acquired traits.

4 Qalyoubia Governorate

Answer the following questions :

Question 1

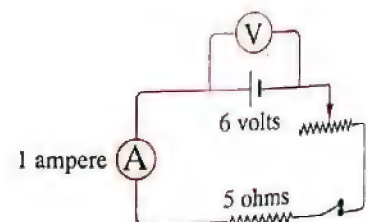
A Choose the correct answer :

1. The measuring unit of electromotive force is ....
   a. ampere. b. ohm. c. coulomb. d. volt.
2. The individual that carries a different pair of genes for a specific trait is ....
   a. pure. b. recessive. c. hybrid. d. dominant.
3. The resistance of the conductor which carries a current of 3 ampere when the potential difference between its two ends is 12 volt equals .... ohm.
   a. 4 b. 6 c. 9 d. 12
4. From the dominant hereditary traits in the human being is ....
   a. presence of dimples. b. smooth hair.
   c. narrow eyes. d. presence of freckles.

B Correct the underlined word(s) from the following :

1. Oxidation is a chemical process where the atom loses **proton** or more during the chemical reactions.
2. Adrenal gland secretes **insulin** hormone.
3. The reaction between silver nitrate with sodium chloride is from **very slow** reactions.
4. The simple goiter is produced due to the decrease in the secretion of **growth** hormone.

C In the opposite electric circuit, calculate the reading of voltmeter when the switch is open.



Question 2

A Choose the correct answer from brackets, and put it in the suitable place in the following statements :

(coulomb – artificial – mercuric oxide – oxygen – natural – copper carbonate – ohm – hydrogen)

1. Cosmic rays are considered from the sources of .... radiation pollution.
2. From examples of compounds which decompose by heat into metal and oxygen is ....
3. The quantity of electricity is measured by a unit called ....
4. Some metal nitrates decomposes into metal nitrite and .... gas evolves.

B **Put sign (✓) or (✗) in the front of the following statement :**

1. Neutralization is a reaction between salt and water to form an acid and an alkali. ( )
2. Mendel covered the stigmas of flowers to prevent the mixed pollination. ( )
3. By increasing the surface area of the reactants exposed to reaction, the chemical reaction stops. ( )
4. When a hybrid red flower pea plant is pollinated with white flower pea plant, all the produced plants are red flowers. ( )

C **What happens when ... ?**

The flow of negative electric charges (electrons) in a metal wire and in only one direction.

Question 3

A **Complete the following tables :**

The hormone name	The secreted gland	The function
Growth hormone	.........(1)........	regulates the general growth of the body
Glucagon	.........(2)........	.........(3)........
.........(4)........	Ovary	promotes the growth of endometrium

The way of connection of cells	+ 1.5 volt, 1.5 volt, 1.5 volt, 1.5 volt −	+ B 1.5 volt 1.5 volt 1.5 volt / 1.5 volt 1.5 volt 1.5 volt − A
e.m.f for the battery	.........(1)........	.........(2)........

B **Choose from column (B), what suits it in column (A) then write the complete statement :**

(A)	(B)
1. A substance which changes the rate of the chemical reaction without changing is called	a. acquired
2. The law of segregation of factors is the .... law of Mendel	b. O_2
3. On heating copper carbonate .... gas evolves	c. second enzymes
4. Learning of walking in children is from the .... traits.	d. hereditary
	e. catalyst
	f. first
	g. CO_2

C **What happens when ... ?**

with explaining by a balanced symbolic equation :

Putting a piece of magnesium sheet in a test tube containing blue copper sulphate soluti

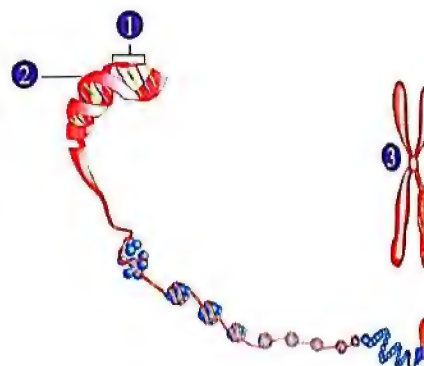
Question 4

A **Write what the following statements indicate to :**

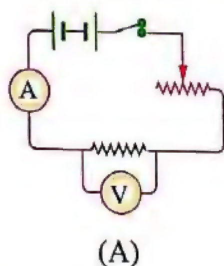
1. The change in the concentration of the reactants and the resultants in a unit time.
2. The elements whose atoms' nuclei contain a number of neutrons more than the numb required for its stability.
3. The arrangement of metals in a descending order according to the degree of their chemi activity.
4. The quantity of electric charges in coulomb flowing through a cross-section of the conductor in one second.

B **1. Study the figure in front of you, then complete the following spaces :**

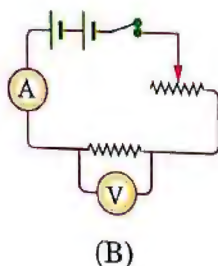
The point number (3) represents .... which its chemically structure from number (2) which is .... and connected with protein, and it carries .... to the individual, while number (1) that represents .... which transmits the hereditary traits from parents to offspring.



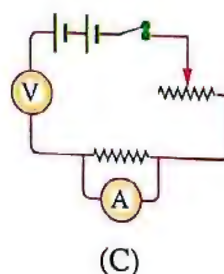
2. Choose the right electric circuit which is used to verify Ohm's law practically. Then write the mathematical relation of Ohm's law.



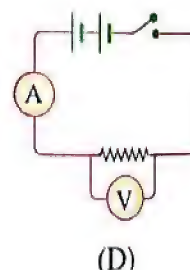
(A)



(B)

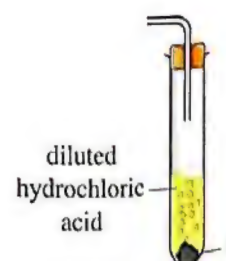


(C)



(D)

C From the opposite figure conclude the produced gas, then write the balanced chemical equation which represents that reaction.



5 El-Menofia Governorate

Answer the following questions :

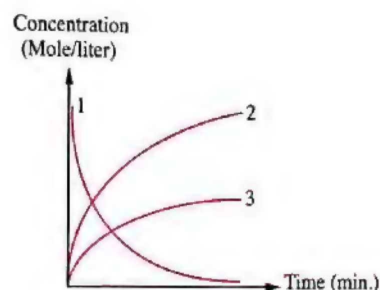
Question 1

A Write the scientific term of each of the following :

1. It is the state of a conductor that shows the transfer of electricity from or to it when it is connect to another conductor.
2. Parts of (DNA) present on the chromosome and they are responsible for appearing the individual (hereditary) traits.
3. The quantity of charge which transferred by a constant intensity of one ampere across the conductor in one second.
4. An individual carries two genetic factors for the character, one of them is dominant and the other is recessive.

B First :

The opposite graph represents concentration of both reactants and products during thermal decomposition of sodium nitrate with the time.



By using the graph complete the following :

1. The curve No. (1) refers to .... compound that has .... color.
2. The curve No. (2) refers to .... compound that has .... color.

Second :

A gland existed in the digestive system of human that has a role in digestion process also it is secretes two hormones with opposite effect due to their functions.

Based on the previous determine each of the following :

1. The name of this gland is ....
2. The name of the first hormone is ....
3. The name of the second hormone is ....

C The potential difference among the terminals of a conductor is 20 volts. a work of 200 joules was done to transfer a charge between its terminals within 2 seconds. Calculate the electric current intensity passing through this conductor ?

Question 2

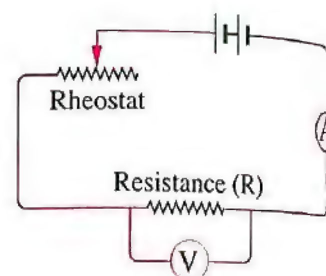
A Choose from column (B), what suits it in column (A) :

(A)	(B)
1. The electric generator (dynamo)	a. should be stable.
2. Covalent compounds	b. they are fast in their reactions.
3. The region chosen to store radioactive wastes	c. produce direct current.
4. Ionic compounds	d. they are slow in their reactions.
	e. produce alternating current.
	f. should be unstable.

B Complete the following by using suitable words :

1. Mendel's second law is called the law of ....
2. The time of combustion (burning) of the steel scourers used for cleaning aluminium burning in pure oxygen in a jar is .... the time of its burning in the atmospheric air.
3. The time of dissolving an effervescence tablet in an amount of cold water is .... the time of dissolving a similar one in the same amount of hot water.
4. The traits that are not transmitted from one generation to another are called ....

C In the opposite circuit when the slider of rheostat moves causing increasing of ammeter reading this means :



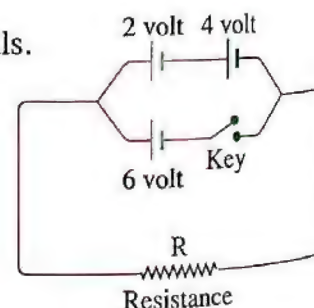
1. The value of rheostat resistance ....
2. The voltmeter reading ....
3. The value of resistance (R) ....

Note : Use (increases – decreases – does not change)

Question 3

A Correct the underlined words :

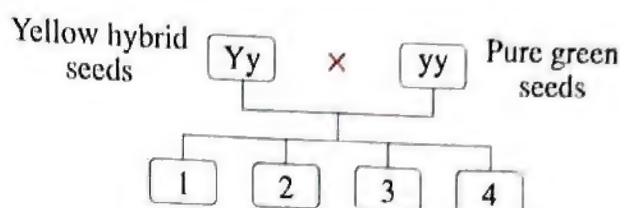
1. The removal of the **thyroid gland** leads to the adrenalin is not secreted that stimulates the body during emergency cases.
2. The **kinetic** energy converts to electric energy in electric cells.
3. **Diabetes** is occurred due to decrease of secretion in the growth hormone at the childhood.
4. In the figure when the key is closed the current intensity that passes through the resistance (R) **increases**.



B **First : complete the following table :**

The reaction	The type of the reaction or the process
$A \longrightarrow A^+ + e^-$	..............................(a)..............................
BC (solution) + $A \longrightarrow AC + B$	..............................(b)..............................

Second : in the given figure replace the number with suitable letters to give the produced generation in your answer sheet ?



C **Explain the following :**

1. On putting a piece of sweet potato in a glass beaker contains hydrogen peroxide the rate of decomposition of it increases.
2. The slow start of the reaction between aluminium and hydrochloric acid practically.

Question 4

A **Put (✓) or (✗) in the front of the following statements :**

1. The reaction between hydrochloric acid and sodium carbonate is a neutralization reaction. ( )
2. Mercury causes the corrosion of the gold when they touch each other because it is more active than gold. ( )
3. The alternating current can be converted to direct current. ( )
4. The rheostat is used to measure the electric resistance. ( )

B **Choose the correct answer :**

1. Which of the following is a dominant trait in human ....
   a. presence of freckles. b. narrow eyes.
   c. straight hair. d. free ear lobe.
2. Electromotive force and potential difference have the same measuring unit which is ....
   a. ohm/ampere b. ampere/ohm
   c. coulomb/joule d. joule/ampere.second
3. The two scientists who made the (DNA) model are ....
   a. Badel and Tatum. b. Badel and Mendel.
   c. Crick and Watson. d. Mendel and Tatum.

4. .... is one of the genetic effects produced due to exposing the human to small dose of radiation for a long period of time.

a. Damage of the central nervous system

b. Damage of the spleen

c. Change the structure of sex chromosomes

d. Change the structure of the hemoglobin

C

1. A (Green compound) $\xrightarrow{\Delta}$ B + $CO_2\uparrow$

2. B + $H_2 \xrightarrow{\Delta}$ X + H_2O

By using the two equations answer the following :

1. Write the chemical formula for A , B , and X (respectively).

2. Name the process that happened to the substance (B) during the reaction number (2) that leads to change it to the substance (X) ?

6 Dakahlia Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

1. On heating copper sulphate, a .... color precipitate is formed.

a. yellow b. blue c. red d. black

2. Genes control the organism's genetic characteristics by producing ....

a. hormones. b. enzymes. c. chemical compounds. d. vitamins.

3. The measuring unit of the quantity of electricity flowing through a cross-section of the conductor in one second is ....

a. coulomb. b. ampere. c. volt. d. ohm.

4. The .... hormone stimulates glucose storage in the liver.

a. calcitonin b. thyroxin c. epinephrine d. insulin

B Write the symbolic balanced equation only for the following :

1. Adding silver nitrate solution to sodium chloride solution.

2. Passing the hydrogen gas through hot copper oxide.

3. Putting a small piece of sodium in water.

4. The reaction between hydrochloric acid with sodium carbonate.

D If you know that the curly hair trait (G) is dominant on the smooth hair trait (g), a man married a woman and they had four children, if you know that half of them got the curly hair and the other half got smooth hair. Illustrate on hereditary bases.

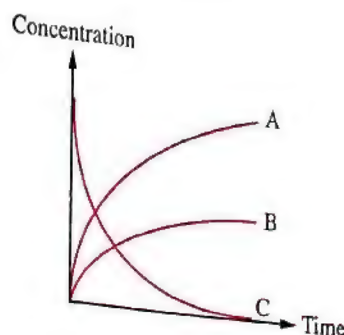
Question 2

A Complete the following statements :

1. The first human tissue which is affected by exposure to radiation is ....
2. The substance which decreases the energy needed for the chemical reaction is called ....
3. The dominant trait which appears on the tongue is ....
4. The glucagon hormone affects on .... when the level of blood sugar decreases.

B From the following equation

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$ and from this shown diagram define which curve represents the concentration of :



1. Copper oxide.
2. Copper sulphate.
3. Sulphur trioxide.
4. What is the type of the shown reaction ?

C Define each of the following :

1. Ohm's law.
2. The speed of chemical reaction.

Question 3

A Correct the underlined words in the following statements :

1. The speed of chemical reaction increases by increasing the concentration due to the <u>Decreasing the surface area</u> between the molecules.
2. Hormones transfer from their sites of secretion to reach their sites of action by the <u>skin</u>.
3. Sodium is monovalent, because it <u>gains one electron</u> to form a positive ion.
4. We can control of the electric current intensity and the potential difference in a circuit by using <u>the voltmeter</u>.

B Write the scientific term of each of the following :

1. The reaction of an acid and an alkali to give salt and water.
2. The spontaneous conversion (naturally) of the nuclei of the atoms of some radiating elements to achieve a more stable composition.
3. The condition of the electrical conductor that indicates the transfer of electricity from it or to it if it is connected to another conductor.
4. Vital structure consists of a nucleic acid and protein carries the genetic information of the living organisms.

C **Compare between :**

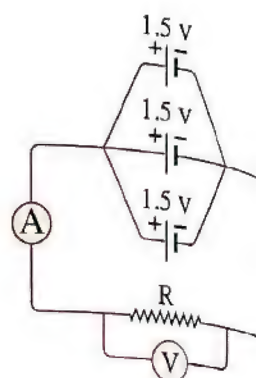
The alternating current and the direct current (according to their source of generation).

Question 4

A **Give reasons for each of the following :**

1. The reactions between ionic compounds are fast.
2. Is often better to use alternating current rather than the direct current.
3. Mendel cultivated pea plants that produce yellow seeds for several generations.
4. The stopping of the body growth may occurs sudden, and the person becomes a dwarf.

B **If a quantity of electricity which passes through the opposite electric circuit in a time 20 seconds is 10 coulombs :**



1. Choose which action is needed to be done so both ammeter and voltmeter show their reading
   (close the key – change resistance – change battery position)
2. Calculate the ammeter reading.
3. Calculate the voltmeter reading.
4. What is the resistance of the wire (R).

C **Write the chemical formula for each of the following :**

1. pentoxide nitrogen gas.
2. hydrogen chloride gas.

7 Sharkia Governorate

Answer the following questions :

Question 1

A **Write the scientific term of each of the following :**

1. The electric state of a conductor that shows the transference of electricity from or to it, when it is connected to another conductor.
2. It is chemically consists of a nucleic acid called DNA combined with protein.
3. The ratio between the work done and the quantity of electric charge which passing between two points.
4. It is the individual that carries a different pair of genes.

B Rewrite the following statements after correcting the underlined words :

1. $Fe + 2HCl \xrightarrow{dil.} \underline{FeCl_3} + H_2\uparrow$
2. Thyroxid gland secretes calcitonin hormone that **regulates the growth of reproductive organs in human.**
3. $2Na + 2H_2O \longrightarrow 2\,NaOH + \underline{O_2} + Heat$
4. **Adrenalin** hormone promotes the growth of endometrium.

C Calculate the potential difference between two terminals of conductor with electric current intensity 5 ampere in time 10 seconds. If the work was 200 joule.

Question 2

A Choose the correct answer between the brackets :

1. Oxygen gas evolves from .... compound by thermal decomposition.
   a. $Cu(OH)_2$ b. $CuSO_4$ c. $CuCO_3$ d. HgO
2. The flow of electric charges through a metal wire represents ....
   a. resistance. b. electric current intensity.
   c. electric current. d. potential difference.
3. Iron filings react with diluted hydrochloric acid faster than a piece of iron and the factor affecting the interaction is ....
   a. the nature of reactants. b. the concentration of the reactants.
   c. the temperature of the reaction. d. catalyst.
4. If the quantity of charge which passes in an electric wire is doubled and the time of its passing decreases to its half, the current intensity will ....
   a. increase four times. b. decrease to quarter.
   c. remains constant. d. doubled.

B Put (✓) or (X) in the front of the following statement :

1. Neutralization it is a reaction between an acid and an alkali to form salt and water. ( )
2. Mendel chose ten traits in pea plant to conduct his experiments. ( )
3. Fireworks reaction is fast but rusting of iron needs million of years. ( )
4. When a male of genetic structure (Bb) and female with genetic structure (bb) are crossed, the predicted percentage for appearance of genetic structure (BB) in there offspring is 25%. ( )

C Show by drawing only the connection of the voltmeter in the electrical circuit to measure :

The potential difference between the two ends of a lamp - the electromotive force between the poles of battery.

Question 3

A Complete the following statements :

1. The current produced from electro chemical cells is the .... current.
2. When the amount of iodine decreases in food the secretion of the .... hormone decreases.
3. The radiologist should not be exposed to radiation amount more than .... millisievert per year.
4. The pituitary gland secretes .... hormone that controls the speed of growth rate of the muscles.

B Choose the correct answer :

1. On adding copper turning to diluted hydrochloric acid .... is produced.
   a. copper hydroxide
   b. copper carbonate
   c. copper chloride
   d. no reaction
2. The two factors of hereditary are similar in the .... individual.
   a. pure
   b. hybrid
   c. recessive
   d. pure and recessive
3. The oxidizing agent is a substance which ....
   a. gives oxygen.
   b. removes oxygen.
   c. gives and removes oxygen.
   d. no correct answer.
4. According to Mendel's second law, each pair of the alternative traits is inherited independently of the others and appears in the second generation at a ratio of ....
   a. 1 : 1
   b. 2 : 1
   c. 3 : 1
   d. 4 : 1

C How can you obtain copper from copper sulphate solution by two methods with writing balanced equation ?

Question 4

A Correct the underlined words :

1. The ionic compounds are fast in their reaction because they decompose into **molecules** that easy share in the reaction.
2. The value of the resistance of a conductor changes according to change in the **potential difference across its terminals**.
3. Nitrogen pentoxide decomposes into nitrogen dioxide and **nitrogen** gas.
4. The measuring unit of **resistance** is volt.ampere.second.

B Complete the following sentences :

1. The .... apparatus is used to measure electric resistance.
2. Mendel covered the .... of pea plant to prevent cross pollination.
3. The electric current intensity passing in an electric device its resistance 5 ohm when the potential difference between its terminals 200 volt .... ampere.
4. Genes control the appearance of hereditary traits of the living organism by producing ....

C A student used 3 grams of manganese dioxide during decomposition of hydrogen peroxide.
Explain :
The reason of using manganese dioxide – the mass of manganese dioxide at the end of the reaction.

8 El-Gharbia Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The ability to roll the tongue is one of the .... traits in the human being.
2. The .... apparatus is used to measure the electromotive force.
3. Every hereditary trait is controlled by two hereditary factors which separate during formation of the ....
4. The .... effects of radiation is a result of changing in the sex chromosomes composition of the cell.

B Write the scientific term for the following statements :

1. The change in the concentration of the reactants and products at a unit time.
2. The hormone that is responsible for the appearance of the male secondary sex characteristics.
3. The arrangement of metals in a descending order according to their chemical activity.
4. They are ductless glands that secrete their hormones directly in the blood.

C Calculate the quantity of electricity that passes through a conductor of a resistance 2200 ohm for two minutes. If the potential difference between its terminals is 220 volt.

Question 2

A Choose the correct answer :

1. When magnesium substitutes copper in copper salt solutions, the colour of the precipitate is ....

a. black. b. red. c. blue. d. green.

2. In the electric cell, ... energy is converted into electric energy.

a. magnetic b. kinetic c. chemical d. light

3. At the end of the chemical reaction, the concentration of the reactants is ....

a. Zero% b. 50% c. 75% d. 100%

4. The nuclear energy is peacefully used in the industrial field to convert sand to .... for manufacturing computer processors.

a. electric energy b. silicon sheets c. nuclear fuel d. atomic bombs

B Put (✓) or (✗) in the front of the following statements :

1. In positive catalytic reactions, catalyst is used to slow down the speed of the chemical reaction. ( )
2. The individual which gains one gene for freckles in the face becomes without this feature. ( )
3. The chemical reaction is a process of breaking up of bonds between molecules of reactants and formation of new bonds in products molecules. ( )
4. The two factors of a hereditary trait are similar in the hybrid individual. ( )

C A battery consists of three similar cells, the electromotive force of each cell is 2 volt.

Calculate the total electromotive force of the cells, when they are connected in :

1. series. 2. parallel. (Write the used law in each case)

Question 3

A Correct the underlined words :

1. Pituitary gland exists below the **pancreas**.
2. Ammeter is connected in the electric circuit in **parallel**.
3. The **estrogen** hormone is secreted on increasing percentage of glucose sugar in the blood.
4. In the circuit of the direct current, **molecules** flow from one of the two poles to the other in the electrochemical cell.

B What is the importance of each of the following ?

1. The genes.
2. Oxidase enzyme in sweet potato.
3. The human genome.
4. The catalytic converter in modern cars.

C Compare between :

"Oxidizing agent and Reducing agent" (according to : the electronic concept).

Question 4

A Choose from column (B), what suits it in column (A) :

(A)	(B)
1. Heating copper sulphate.	a. $\frac{\text{volt}}{\text{ampere}}$
2. Ampere.	b. $\frac{\text{Joule}}{\text{coulomb}}$
3. Ohm.	c. $\frac{\text{coulomb}}{\text{second}}$
4. The reaction of zinc with dil. hydrochloric acid.	d. thermal decomposition
	e. double substitution.
	f. simple substitution.

B What are the results of each of the following ?

1. Touching two charged conductors by a conducting bar, the first conductor has an electric potential is equal to the electric potential of the second one.
2. The stigma of the flower of pea plant uncovered during the study of the inherited traits.
3. Vanishing or decreasing the attraction force in the atom between the nucleus and the electrons in the outer level.
4. A gene failed to produce its own enzyme.

C If you have the following substances :

(hydrochloric acid – silver nitrate – sodium carbonate – sodium chloride)

Show by balanced symbolic equations only how to get :

1. A white precipitate
2. A gas turbids limewater.

9 Damietta Governorate

Answer the following questions :

Question 1

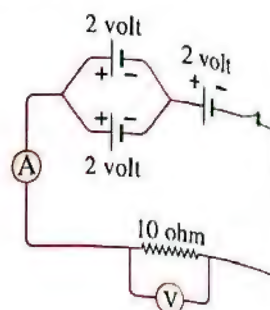
A Write the scientific term for each of the following :

1. The quantity of charges transferred by a constant current intensity of one ampere in time of one second.
2. The cells in which the chemical energy is converted into electric energy.
3. The trait that appears in all individuals of the first generation in Mendel's experiment.
4. Parts of DNA that are present on the chromosomes and control the hereditary traits of the individual.

B **Complete the following sentences :**

1. The double substitution reactions between salt solutions are accompanied by the formation of ....
2. When the amount of iodine decreases in the food, the secretion of the .... hormone decreases.
3. Some reactions are very slow and need several months to take place such as ....
4. The pancreas secretes .... hormone to raise the level of glucose sugar in blood.

C **From the opposite figure calculate :**



1. The electromotive force of the battery.
2. The electric current intensity passing through the circuit.

Question 2

A **Choose the correct answer :**

1. The reaction of an acid with an alkali to give salt and water is known as .... reaction.
   a. reduction b. neutralization c. simple substitution d. oxidation
2. The flow of electric charges through a metal wire in closed circuit represents ....
   a. the electric resistance. b. the electric current intensity.
   c. the electric current. d. the electric potential difference.
3. All of the following metals replace hydrogen of the dilute acid except ....
   a. Au b. Al c. Zn d. Sn
4. The changes in the sex chromosomes composition of parents from the .... effects of radiation.
   a. physical b. genetic c. cellular d. physical and cellular

B **Rewrite the following statements after correcting the underlined words :**

1. Mendel's first law is called the law of **independent assortment of hereditary factors**.
2. When sodium atom loses an electron from its outermost energy level, it becomes **reduced and oxidizing agent**.
3. When an individual carries hybrid dominant trait (Bb) and female carries recessive trait (bb) copulate, the result of the crossing **75% dominant and 25% recessive**.
4. Most metal sulphate decompose by heating into metal oxide and **carbon dioxide** gas evolves.

C **What happens when ...?**

1. Two conductors having the same electric potential are connected together by a wire.
2. Exposing a man for a large dosage of atomic radiation for a short period of time.

Question 3

A Put (✓) or (X) in the front of the following statements :

1. Gigantism is a continuous growth in limbs bones as a result of deficiency of growth hormone in childhood. ( )
2. The e.m.f of three similar cells connected in parallel is equal to the e.m.f. of one cell. ( )
3. Adrenalin hormone stimulates body's organs to respond to emergencies. ( )
4. The ohmmeter is used to measure the potential difference of an electric circuit. ( )

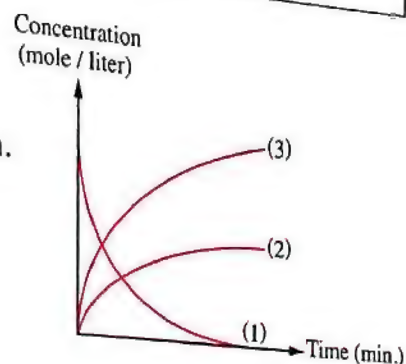
B Choose from column (B), what suits it in column (A) :

(A)	(B)
1. The recessive trait is always	a. hybrid only.
2. Curly hair from the	b. the electric generator.
3. Source of alternating current is	c. pure only.
4. The measuring unit of electric potential difference is	d. dominant traits.
	e. volt.
	f. recessive traits.

C The opposite graph represents :

The rate of thermal decomposition of sodium nitrate.

1. Write the balanced symbolic equation of this reaction.
2. Replace the numbers on the figure by suitable substances from the equation.



Question 4

A Choose the correct answer :

1. The genetic structure of wrinkled yellow colored seeds of a pea plant is ....
   a. YYSS b. yyss c. YYss d. yySS
2. At the beginning of the reaction, the percentage of the reactants concentration equals ....
   a. 100% b. 0% c. 50% d. 25%
3. The .... is responsible for carrying oxygen to the body cells.
   a. bone marrow b. blood hemoglobin c. chromosomes d. genes
4. The air bag contains sodium .... substance.
   a. azid b. sulphate c. oxide d. carbonate

B **1. What happens when ...?**

a. Mating between two pure individuals different in two pairs of contrasting traits (explain on genetic principles).

b. Heating of red mercuric oxide.

2. You have three similar electric cells, show by drawing how you can connect them to get the highest electromotive force. (e.m.f.) (Mention the type of connection)

C **Give reasons for :**

1. Not keeping silver nitrate solution in aluminium containers.
2. The fridge is used to preserve food.

10 Kafr El-Sheikh Governorate

Answer the following questions :

Question 1

A **Complete the following sentences :**

1. The color of copper carbonate changes from green to .... when heated.
2. Scientists found that .... are DNA parts present on the chromosomes.
3. .... gland consists of two lobes and located in the front surface of the neck.
4. $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 +$ ....

B **Give reasons for :**

1. Aluminium practically late in its reaction with hydrochloric acid.
2. Cooling food preserves it for long period of time.
3. Mendel selected pea plant to conduct his experiments.
4. Reaction between ionic compounds is fast.

C **Mention :**

What was the discovery of Henry Becquerel that made radioactivity to be known for the first time ?

Question 2

A **Choose the correct answer :**

1. On mating two parents one of them has a dominant pure trait while the other has a recessive trait the percentage of recessive traits in offspring of the first generation is ....

a. 75% b. 50% c. 25% d. Zero%

2. Sliding rheostat is used to .... the resistance value in an electric circuit.
   a. change b. measure c. magnify d. diminish
3. Zinc element is more active than ....
   a. potassium. b. hydrogen. c. sodium. d. magnesium.
4. Nuclear reactions can't be controlled in ....
   a. nuclear reactors. b. medical labs. c. turbines. d. nuclear bombs.

B Give one example the followings :

1. A chemical compound that decomposes by heat.
2. A source of electric current.
3. A peaceful use of nuclear energy.
4. A dominant hereditary trait.

C Mention the name and function of what is called the master gland in the human body.

Question 3

A Write the scientific term for each of the following :

1. The international unit of measuring the radiation absorbed by the human body.
2. A substance that changes the rate of the chemical reaction without being changed.
3. An instrument used to measure current intensity.
4. Traits that are not transmitted from one generation to another.

B Mention one use or benefit of each of the following :

1. Alternating electric current.
2. Voltmeter.
3. Car air bag.
4. Adrenal glands.

C Write the chemical equation which illustrates the reaction between hydrochloric acid and sodium hydroxide.

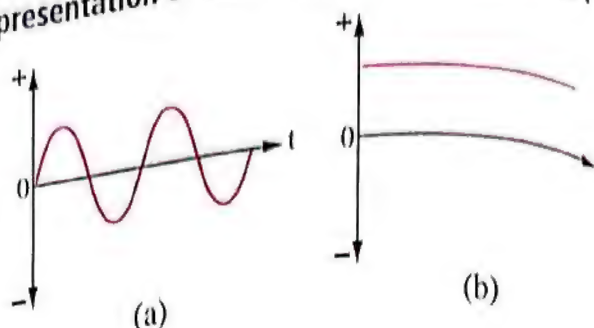
Question 4

A Correct the underlined words from the followings :

1. The testosterone hormone is responsible for appearance of **female** secondary sex characters.
2. Mercuric oxide has **silvery** color.
3. Rate of chemical reaction depends on concentration of the **products**.
4. Dynamo converts **light** energy into electric energy.

B The figure shown to you is a graphic representation of the types of electric currents :

1. Give name to the current in figure (a) and (b)
2. Mention which type of them can be transported to long distances.
3. Mention which type of them is produced from electrochemical cells.



C **Mention :**

What will be the result of the decrease in the secretion of the insulin hormone.

11 Behira Governorate

Answer the following questions :

Question 1

A **Choose the correct answer :**

1. Which material doesn't produce black product when it is heated ....

   a. $CuCO_3$ b. $CuSO_4$ c. $Cu(OH)_2$ d. HgO

2. All of the following elements can substitute the hydrogen of diluted acids except ....

   a. Al b. Zn c. Au d. Pb

3. All of the following units are used to measure the electric current intensity except ....

   a. ampere b. joule/coulomb c. coulomb/sec d. volt/ohm

4. .... is secreted by pituitary gland to regulate the growth rate of muscles and bones.

   a. Growth b. Clacitonin c. Adrenalin d. Insulin

B **Determine the importance or uses of the following :**

1. Catalytic converter in modern cars.
2. Clothes and cloves are used by radiologist in hospitals.
3. Alternative current.
4. The genes.

C **Find out the electric current intensity in the wire when the work is done 20 joule to transfer quantity of electricity 40 coulomb cross section of wire its resistance 10 ohm.**

Question 2

A What is meant by the following ...?

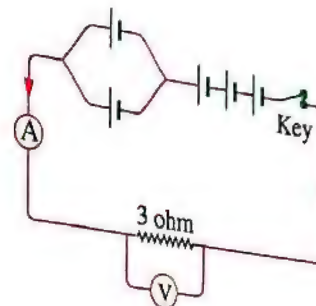
1. The chromosome.
2. Ampere.
3. Direct current.
4. Oxidation process. (electronic concept)

B What happens when ...?

1. Two charged conductors are touched and the electric potential of one of them larger than another.
2. Increasing glucose level in the blood above the normal level.
3. Put a small piece of sodium in water cup.
4. Mating two pure individuals are different in pair of their contrasting traits.

C In the following electric circuit in the figure :

If the potential difference between resistance ends equals the total (e.m.f.) of all cells, if the (e.m.f.) of each cell equals 1.5 volt and the resistance 3 ohms. Find the electric current intensity passes in Ammeter.



Question 3

A Write the scientific term for the following statements :

1. The genetic map of genes that is existed on the human chromosomes.
2. The opposition of electric current in a cross-section of a conductor.
3. Traits can't transfer from one generation to another.
4. Chemical substances which are produced by living organism's body to work as a catalyst to increase the speed of vital biological reactions.

B Correct the underlined words :

1. The reactions of ionic compounds are fast because they are decomposed into **molecules** easier to react.
2. Measuring unit of electric charge is **volt**.
3. From the recessive traits of pea plant is **swollen** pod.
4. At the end of the chemical reaction the ratio of reactants concentration is **100** %

C Compare between :

The positive catalytic reactions and negative catalytic reactions.

Question 4

A Complete the following sentences :

1. $2NaNO_3 \xrightarrow{\Delta}$ .... + ...
2. Thyroid gland secretes .... hormone which is responsible for regulating calcium level in the blood.
3. $Mg + CuSO_4 \longrightarrow$ .... + ...
4. The speed of most of chemical reactions ...., by increasing of temperature.

B Give reasons for :

1. The ability of rolling tongue from the dominant traits of human.
2. The resistance of electric conductor increases by increasing its length.
3. The silver colour appears when the red mercuric oxide is heated.
4. Black substance is formed if the blue copper hydroxide is heated.

C Explain, on genetic bases, the product of the mating of a tomato plant with red fruits (Rr) and a green tomato plant (rr), showing the characteristics of the resulting generation and the ratio of the resulting individuals.

12 Ismailia Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. The .... apparatus is used to measure the electric current intensity, while .... is measured by using voltmeter.
2. Electric cells produce .... current, while the dynamo produces .... current.
3. Each hereditary trait is controlled by .... which are separated during formation of the ....
4. The ability to roll the tongue is one of the .... traits, while the attached ear lobe is from .... traits.

B Choose from columns (B) and (C), what suit it in column (A) :

(1)

	(A) reaction	(B) evolving gas	(C) gas detection
a.	Sodium with water	1. SO_3	A. increases the glow of the burning match.
b.	Heating sodium nitrates	2. H_2	B. burning with a pop sound.
		3. O_2	C. turbid the clear limewater.

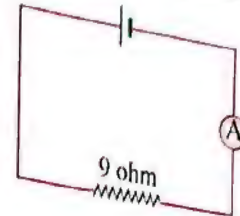
(2)

	(A) gland	(B) hormones	(C) function
a.	Pancreas	1. Adrenalin	A. It stimulates the growth of endometrium (the lining of uterus).
b.	Thyroid	2. Glucagon	B. it controls the level of calcium in blood.
		3. Calcitonin	C. stimulates the release of glucose sugar from liver cells.

D In the opposite electric circuit

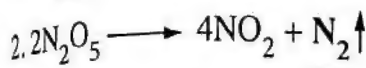
If the potential difference between the two ends of the resistance = 18 volt.

Calculate the reading of the ammeter.



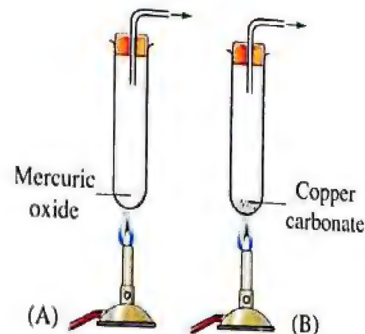
Question 2

A Correct the underlined words :

1. In <u>**positive catalytic**</u> reactions, catalyst is used to slow down the chemical reaction.
2.  $2N_2O_5 \longrightarrow 4NO_2 + \underline{N_2}\uparrow$
3. The transference of electric charges between two conductors depends on <u>**the electric current intensity passing through**</u> the two conductors.
4. The measuring unit of absorbed radiation is <u>**Rontgen**</u>.

B Compare between :

1. Colour of the substance in the tubes A and B after heating.
2. Oxidizing agent and reducing agent according to losing and gaining electrons.
3. The hereditary traits and the acquired traits according to transferring through generations.
4. Mendel's first law and Mendel's second law according to the name of each law.



C Illustrate by drawing, how to connect 3 electric cells :

The e.m.f of each is 3 volt to obtain a battery its e.m.f equals

1. 6 volt
2. 3 volt

Question 3

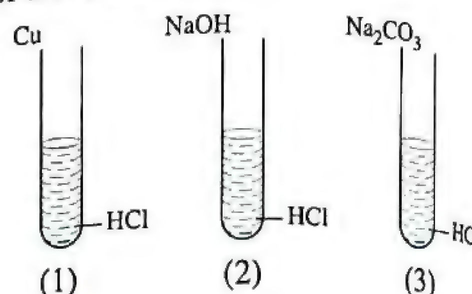
A Write the scientific term for the following statements :

1. It is the quantity of electric charges flowing in coulomb through a cross-section of a conductor in one second.
2. The cells which can be used to convert the chemical energy into electric energy.
3. A chemical message that controls and regulates the activities and functions of most of the body organs.
4. A disease caused by the decrease in the secretion of the insulin hormone.

B 1. Study the opposite figure, then answer :

a. In which tube the gas evolved.

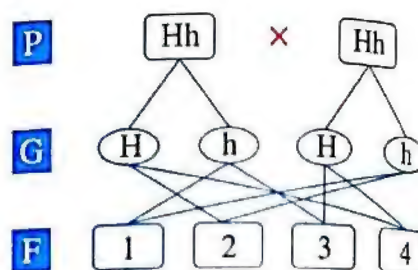
b. Mention the type of the reaction in tube 2.



2. The opposite figure represents the inheritance of one of humans' traits :

a. What is the number of the child that carries the recessive trait ?

b. What is the ratio of its appearance.



C Which of the following will rust faster and why :

Leaving an iron wire of 10 gm mass or iron filings have the same mass in humid place.

Question 4

A Choose the correct answer :

1. When there is a sudden decrease in the car speed, the sodium azid is decomposed into .... gas.

   a. N_2 b. H_2 c. O_2 d. CO_2

2. The rate of chemical reaction is increased by rising temperature due to increasing ....

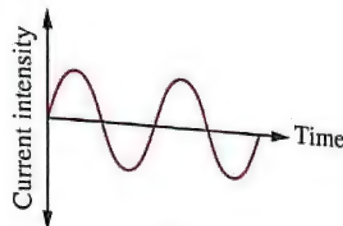
   a. the surface area exposed to the reaction.
   b. the number of molecules.
   c. the number of probable collisions between molecules.
   d. the concentration of the reactants.

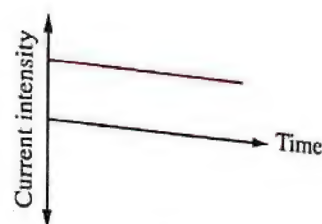
3. In the electric circuit, the sliding rheostat is used to ....

   a. measure the electric current intensity. b. measure the potential difference.
   c. change the resistance value. d. open and close the circuit.

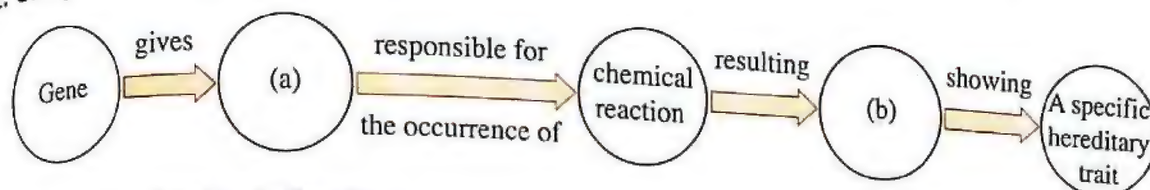
4. Improving of some plant races is from the uses of nuclear energy in the .... field.
a. medical b. drilling c. industrial d. agricultural

Ⓑ 1. Which of the two following graphs :
a. Expresses the current which is able to transmit for long distances.
b. Is used in electroplating processes.





2. Complete the following diagram :



Ⓒ Give reasons for the following :
1. The fridge is used to preserve food.
2. Not keeping silver nitrate solution in aluminum containers.

13 Suez Governorate

Answer the following questions :

Question 1

Ⓐ Complete the following sentences :
1. Active metals substitute .... of water and produce metal hydroxide.
2. There are two sources of radiation pollution .... and ....
3. The trait that appears in all individuals of the first generation in Mendel's experiments is known as ....

Ⓑ 1. What happens in the following cases ?
a. Heating of blue copper sulphate.
b. When the individual carries a recessive gene from both parents.
2. What is the importance of each of the following ... ?
a. The nucleic acid DNA. b. The endocrine glands.

Ⓒ If the work done to transfer an electric charge of 600 coulombs between two points in a time 5 minutes equals 3600 joules. Calculate :
1. The current intensity.
2. The potential difference between the two points.

Question 2

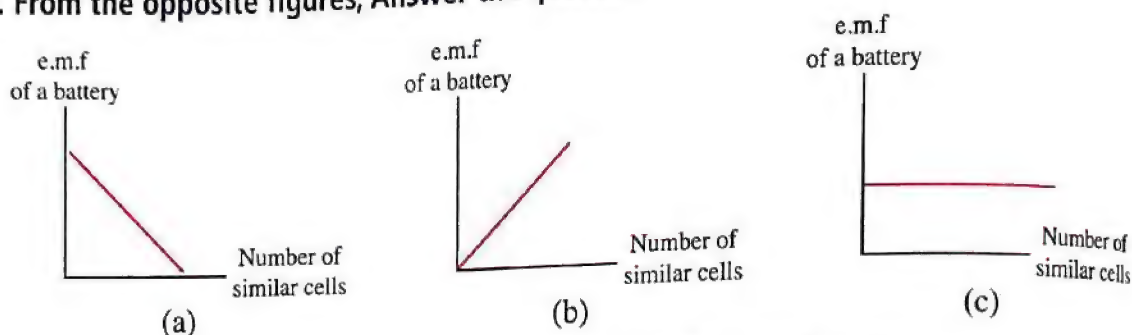
A Correct the underlined words :

1. Sodium nitrates decompose by heating into sodium nitrite and **nitrogen** gas evolves.
2. The **pure** individual carries a different pair of genes (hereditary factors) one is dominant and the other is recessive.
3. When the level of sugar decreases in the blood, pancreas secretes the **insulin** hormone.
4. The reactions of ionic compounds are **slower** than that of the covalent compounds.

B 1. Give reasons for : (2 points only)

1. A white precipitate is formed on adding silver nitrate solution to sodium chloride solution.
2. Mendel selected the pea plant to conduct his experiments.

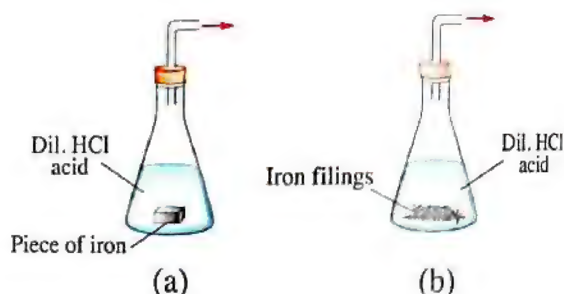
2. From the opposite figures, Answer the questions :



1. Fig .... represents the connection of several similar cells in series.
2. Fig .... represents the connection of several similar cells in parallel.

C From the opposite figures, Answer :

1. Which reaction is faster (a) or (b).
2. What happens if iron is replaced by copper ?



Question 3

A Choose the correct answer :

1. The element which is more active in the series of chemical activity is ....
   a. gold. b. hydrogen.
   c. sodium. d. aluminum.
2. The electric current intensity passing through a conductor whose resistance is one ohm and the potential difference between its terminals is one volt is ....
   a. ohm. b. ampere.
   c. coulomb. d. volt.

3. The hormone responsible for the appearance of the female secondary sex characters is ....

a. estrogen. b. testosterone.

c. adrenalin. d. thyroxin.

4. At the beginning of the chemical reaction, the percentage of the reactants concentration is .... %

a. zero b. 25

c. 50 d. 100

B 1. **When you pollinate a pure tall stem pea plant with a short stem pea plant, it produces plants all are tall stem.**

Use the symbols in expressing the results of this crossing.

2. **Complete the following equations :**

1. $H_2 + CuO \xrightarrow{\Delta}$ .... $+ H_2O$

2. $Na_2CO_3 + 2HCl \longrightarrow$ .... $+ H_2O +$ ....

C What is meant by ... ?

1. The catalyst.
2. Radioactivity phenomenon.

Question 4

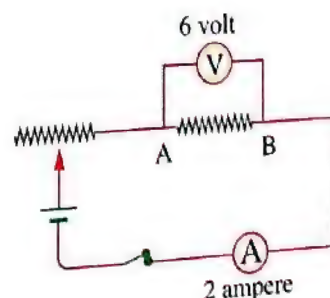
A Write the scientific term :

1. A chemical process in which an atom gains one electron or more.
2. The flow of electric negative charges (the electrons) in a conducting substance (metal wire).
3. The reaction between an acid and an alkali to form salt and water.
4. The gland that secretes calcitonin hormone.

B Compare between :

1. Direct current and Alternating current. (2 points only)
2. Hereditary traits and acquired traits.

C From the opposite circuit, complete the following :



1. The type of resistance A B is ....
2. The value of the resistance A B = ... ohms.

14 Port Said Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. .... is measured by using the voltmeter and has a measuring unit known as ....
2. Chromosome is chemically consisted of a nucleic acid called .... bind with ....
3. Electric current is generated from the dynamo due to the converting .... energy to .... energy.
4. Mendel chose the garden pea plant because of its .... life cycle and its fast ....

B Compare between :

1. Ionic compounds and covalent compounds (from point of view of speed of reactions).
2. Dwarfism and exophthalmic goiter (from point of view of reason of occurrence).

C Calculate the potential difference between the terminals of a vacuum cleaner of a resistance 22 ohm and the current passes through it is 10 ampere.

Question 2

A Write the scientific term :

1. The change in the concentration of the reactants and products at a unit time.
2. A chemical reaction in which a metal replaces another metal in one of its salt solutions.
3. The flow of negatively electric charges through a conductor.
4. The spontaneous decay of the atoms' nuclei of some elements that are present in nature in an attempt to achieve a more stable composition.

B Put (✓) or (✗) :

1. When a pure short stem pea plant is pollinated with a hybrid long stem one all produced plants are short stem. ( )
2. Oxidation and reduction are not concurrent processes. ( )
3. Sweet potato contains oxidase enzyme which acts as a catalyst. ( )
4. The free ear lobe is a dominant trait in the human being. ( )

C You have four similar cells, the electromotive force of each is 1.5 volt.
Explain by using two diagrams how you can connect them to obtain an e.m.f of 3 volts.

Question 3

A Choose the correct answer :

1. The .... hormone liberates the needed energy from the food stuff.
   a. growth b. esterogen c. thyroxin d. adrenalin
2. The radioactive phenomenon was discovered by the scientist ....
   a. Ohm. b. Becquerel. c. Ampere. d. Mendel.
3. Insulin hormone is secreted by ....
   a. liver. b. pancreas. c. thyroid gland. d. pituitary gland.
4. From the characteristics of alternating current ....
   a. only constant intensity. b. only variable direction.
   c. variable intensity and direction. d. only variable intensity.

B Define each of the following :

1. Acquired traits
2. Gametes
3. Neutralization reaction
4. Reduction

C Illustrate by balanced symbolic equations the effect of heat on copper sulphate then passing of hydrogen gas through the resultant.

Question 4

A Choose from column (B), what suit it in column (A) :

(A)	(B)
1. Used to control the electric resistance of the circuit	a. red precipitate is formed
2. When adding copper to dilute hydrochloric acid	b. white precipitate is formed
3. Used to measure the electric current intensity	c. rheostat
4. When magnesium replaces copper in one of its salt solutions	d. no reaction
	e. ammeter

B Correct the underlined words :

1. Measuring unit of electromotive force is <u>coulomb</u>.
2. The resistance of a conductor is <u>ten</u> ohms when the potential difference of one volt between its ends produces a current of one ampere.
3. Mendel's first law is called law of <u>independent assortment of the hereditary factors</u>.
4. Mendel removed the stamens of flowers of pea plant before the another becomes mature to prevent the <u>cross</u> pollination.

C How can you distinguish between magnesium sulphate solution and copper sulphate solution by using a piece of zinc ?

15 Fayoum Governorate

Answer the following questions :

Question 1

A Complete the following :

1. The .... apparatus is used to measure the current intensity while the .... apparatus is used to measure the potential difference.
2. The sources of radiation pollution are divided into .... sources and .... sources.
3. According the Mendelian heredity, straight hair trait is a .... trait while the presence of dimples in the face is a .... trait.
4. .... is a science that researches the transmission of the hereditary traits from .... to the offspring.

B Correct the underlined words in the following statements :

1. **Oxidation** reaction is the reaction between an acid and an alkali to form salt and water.
2. Most metal carbonates decompose by heating to **metal** and carbon dioxide.
3. **Duct** glands secrete hormones in the human body.
4. **The iron** element shares in composing thyroxin hormone.

C Calculate the quantity of electricity that passes through a conductor of resistance 1000 ohm for 30 minutes, if the potential difference between its terminals equals 220 volt.

Question 2

A Choose the correct answer to complete the following statements :

1. The physical quantity which its measuring unit equivalent (volt / ampere) is ....
   a. current intensity. b. electric resistance.
   c. potential difference. d. quantity of electricity.
2. The rate of the chemical reaction increases by rising temperature due to increasing of ....
   a. surface area exposed to reaction.
   b. numbers of molecules.
   c. number of probable collisions between molecules.
   d. no correct answer.
3. Oxygen gas is produced when .... compound decomposes by heat.
   a. $NaNO_3$ b. $CuCO_3$ c. $CaSO_4$ d. $Cu(OH)_2$
4. From properties of the direct current is ....
   a. constant intensity only. b. variable direction.
   c. variable intensity and direction. d. constant intensity and direction.

B Write the scientific term for each of the following statements :

1. The substance which loses one or more electrons during a chemical reaction.
2. The change in the concentration of the reactants and resultants at a unit time.
3. Plant that Mendel chose in his experiments.
4. It is chemically consisted of a nucleic acid called DNA connected with protein.

C You have three similar cells, the electromotive force of each is 2 volt, explain by using a diagram how you can connect them to obtain the e.m.f. of :

1. 6 volt
2. 2 volt

Question 3

A Exclude the unsuitable word or sentence and mention what the rest has in common :

1. Pituitary gland – salivary gland – Thyroid gland – Pancreatic gland.
2. Master gland – Two lobes – Pituitary gland – Thyroid gland.
3. Pressure – Potential difference – Current intensity – Electric resistance.
4. Radium – Uranium – Sodium – Zirconium.

B Choose from column (B), what suits it in column (A) :

(A)	(B)
1. Manganese dioxide	a. are always pure.
2. Reacting sodium with water	b. cannot transmitted from one generation to another.
3. Acquired traits	c. catalysts.
4. Recessive traits	d. simple substitution reaction.
	e. precipitation.

C Show by the balanced symbolic equations the following reactions :

1. Adding silver nitrate solution to sodium chloride solution.
2. The effect of heat on copper sulphate.

Question 4

A Give an example for :

1. The physical quantity which is measured with a measuring unit (ampere).
2. Military use for nuclear energy.
3. Reaction which is very slow.
4. Reaction takes very short time.

B **Put (✓) or (✗) then correct the wrong ones :**

1. Fixed resistance cannot be controlled but rheostat can be controlled. ( )
2. The measuring unit of absorbed radiation by human body is curie. ( )
3. Mendel's second law is called the law of independent assortment of hereditary factors. ( )
4. The wide eyes and narrow eyes are hereditary traits. ( )

C **What would happen in each of the following ... ?**

1. Putting flame of the match stick near to the top of the tube after heating red mercuric oxide. ( )
2. Increasing the concentration of the reactants. ( )

16 Beni-Suef Governorate

Answer the following questions :

Question 1

A **Complete the following statements :**

1. The law of independent assortment of hereditary factors is .... Mendel law.
2. Force of .... is considered as the source which provides the atom with a huge energy.
3. Each hereditary trait is controlled by hereditary factors which separate when the .... are formed.
4. To measure electric current intensity .... apparatus is connected as series in electric circuit.

B **Put sign (✓) in front of correct answer or (✗) in front of wrong one :**

1. Oxidation is a chemical process that an atom loses one proton or more. ( )
2. Hormones are secreted from special organs known as endocrine glands. ( )
3. Thyroid gland secretes adrenalin hormone that reduces level of sugar in the blood. ( )
4. Increases surface area of reactants increases speed of chemical reaction. ( )

C **Show by drawing and calculate the electromotive force for electric cell to connect 3 cells e.m.f for each one 2 volt :**

1. As series connection.
2. As parallel connection.

Question 2

A Choose the correct answer :

1. Which of the following substances don't form a black precipitate after heating ....
   a. copper carbonate.   b. copper sulphate.
   c. sodium nitrate.   d. copper hydroxide.
2. By increases concentration of reactants the number of collisions ....
   a. decreases.   b. increases.
   c. stopped.   d. increases then decreases.
3. When the quantity of electric charges is doubled when the time is constant so electric intensity ....
   a. decreases to half.   b. increases four times.
   c. increases twice.   d. decreases to quarter.
4. From radioactive elements ....
   a. radium.   b. copper.   c. gold.   d. silver.

B Complete the following sentences by using the following words :
(hydrogen gas – oxygen gas – recessive trait – dominant trait – nitrogen gas)

1. Trait always pure is ....
2. Aluminium reacts with dilute acids and .... evolved and burned with pop sound.
3. A hereditary trait appears by mating a dominant trait with recessive one is ....
4. Mercuric oxide is decomposed by heating and .... evolved that increases glowing of splint.

C Find a potential difference between terminals of conductor its resistance (20 ohm) and its intensity (4 ampere).

Question 3

A Write the scientific term for each of the following statements :

1. It is the opposition that the electric current faces during its passage through a conductor.
2. It is an electric current which has a variable intensity and flow in two opposite directions in the electric circuits.
3. It is a chemical messages that control and organize most of vital activities in the bodies of living organisms.
4. A gland responsible for secretion a hormone which determines the height that the person will reach.

B **Match between column (B), which suits in the column (A) and write a complete sentences in your answer sheet :**

(A)	(B)
1. Exposure for large dosages in short time	a. is a acquired trait.
2. Exposure for small dosages in long time	b. is a recessive trait.
3. Ability of rolling tongue in the human is	c. is a dominant trait.
4. Learning swimming and new languages	d. causes damage spleen and centeral nervous system.
	e. chemical composition of the hemoglobin changes.

C **Write a balanced chemical equation that indicates reaction of sodium chloride solution and silver nitrate solution.**

Question 4

A **Correct the underlined words :**

1. The end of chemical reaction concentration of resulting are **equal to** concentration of reactants.
2. In the electric cells the **mechanical** energy converted into electrical energy.
3. Enzymes act to **constancy** speed of vital activities in the human body.
4. The potential difference between two terminals in an opened circuit represents **electric resistance** for the electric source.

B **Choose the correct answer :**

1. The measuring unit for potential difference is ....
   a. ampere. b. joule. c. volt. d. ohm.
2. Direct current is used in ....
   a. lighting streets. b. electroplating. c. lighting houses. d. operating factories.
3. On crossing a pure tall pea plant (TT) with a pure short pea plant (tt) in the second generation, the trait of shortness of stem appears with ratio ....%
   a. 100 b. 75 c. 50 d. 25
4. From the dominant traits in the human ....
   a. blue eyes. b. straight hair. c. curly hair. d. presence of freckles.

C **Give a reason for :**

Reactions between ionic compounds are fast while reactions between covalent compounds are slow.

17 El-Minia Governorate

Answer the following questions :

Question 1

A Complete the following statement by the suitable word from between the brackets :

(Radiations – gametes – H_2O – dynamo)

1. In every hereditary trait, there are two factors be separated during the formation of ....
2. The international unit for measuring .... absorbed by human body is sievrt.
3. .... changes kinetic energy to electric energy.
4. $NaOH + HCl \longrightarrow NaCl +$ ....

B Put (✓) or (✗) in front of the following statements :

1. Sweet potato contains oxidase enzyme and it works as a catalyst. ( )
2. Reducing agent is the substance which gains one electron or more during chemical reaction. ( )
3. Recessive traits are transmitted from one generation to another. ( )
4. Genetic modified rice is used to solve the problem of the vitamin (A) resulted from malnutrition. ( )

C If you have 4 electric cells e.m.f for each is 1.5 volt show by drawing only how to connect them to get a battery of e.m.f of : (4.5 volt - 6 volt).

Question 2

A Write the scientific term for each of the following statements :

1. The change in the concentration of reactants and products resulting from reaction per a unit time.
2. Metallic box found in modern cars for the treatment of harmful gases produced from burning fuel.
3. Electric current intensity resulting from passing quantity of electricity equals one coulomb through cross section of a conductor in time equals one second.
4. The resistance of an electric conductor for passing electric current its intensity 1 ampere passing through it when the potential difference between its terminals equals 1 volt.

B Correct the underlined words in the each statements :

1. Every hereditary trait in the living organism, two similar hereditary factors control it, in the **hybrid** person.
2. The second law of Mendel is known as **law of segregation of factors**.
3. The reaction of hydrochloric acid with iron filings is faster than its reaction with a piece equals in mass due to **high concentration**.
4. The reactions which happened to form oil inside the Earth **need many months**.

C If the work done to transfer electric charge 30 coulomb between two points, is equals to 3330 Joule. Calculate potential difference between the two points.

Question 3

A State one importance for each :

1. Sliding rheostat.
2. Nuclear reactors.
3. Adrenalin hormone
4. Glucagon hormone.

B Choose the correct answer :

1. On adding manganese dioxide powder to hydrogen peroxide solution, the quantity of manganese dioxide ....
   a. increases.
   b. decreases.
   c. affects on the start of reaction.
   d. does not change.
2. .... is chemically consisted of nucleic acid bind with protein.
   a. Cytoplasm
   b. Gene
   c. Chromosome
   d. No correct answer.
3. From recessive traits in human being is ....
   a. presence of check dimples.
   b. narrow eyes.
   c. wide eyes.
   d. curly hair.
4. On sudden and fast decrease in the speed of car, sodium azid is decomposed and .... gas is evolved.
   a. N_2
   b. H_2
   c. O_2
   d. CO_2

C Give a reason for :

The reactions between ionic compounds are faster than that of covalent compounds.

Question 4

A What happens in each cases ...?

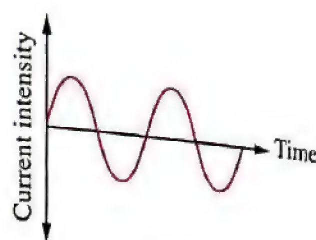
1. Heating Mercuric oxide (with writing equation).
2. If two charged conductors differ in their electric potential, are connected together.
3. If a person subjected to a large dose of radiation during a short period of time.
4. On putting a small piece of sodium in water.

B Choose from column (A), what suits it in column (B) :

(A)	(B)
1. Sodium nitrate decomposes by heating	a. Dr. Ali Mostafa Mosharafa.
2. Aluminium replaces hydrogen of dilute acid	b. and produces yellowish white substance and oxygen gas evolved.
3. Egyptian scientist has theories in the fields of atom and radiation	c. scientist Mendel
4. The discovery of radioactivity phenomenon is related to	d. salt of an acid is formed and hydrogen gas evolved.
	e. scientist Henry Becquerel

C Study the figures in front of you then answer :

(a)



(b)

What is the current which represents figure (a) and which of them can be transmitted for long distances ?

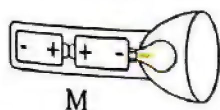
18 Assiut Governorate

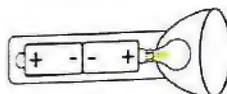
Answer the following questions :

Question 1

A Choose the correct answer :

1. At the decomposition of sodium nitrates by heating .... gas evolves.
   a. NO b. O_2 c. H_2 d. CO_2
2. The .... hormone controls the level of calcium in the human body.
   a. calcitonion b. thyroxin c. adrenalin d. progesterone
3. The following figures show : - A flashlight and three ways to connect two batteries


M


L

K

Which of the following methods must be connected to the batteries in order to turn on the lamp ....
   a. figure K only. b. figure L only. c. figure M only. d. no correct answer.

4. The measuring unit of absorbed radiation is the ....

a. roentgen. b. curie. c. sievert. d. coulomb.

5. Which one of these traits is recessive in human ? ....

a. Curly hair. b. Wide eyes. c. Straight hair. d. Free ear lobe.

B What happens when ... ?

1. Adding diluted HCl to the copper.
2. The effects of exposure to a large dosage of radiation for a short time.
3. Increasing the surface area exposed to reaction "related to the rate of the reaction".

C From the following table :

1. Write the equation of the reaction of sodium with chlorine to from sodium chloride.
2. Determine the oxidizing agent and reducing agent and state the reason.

Element	Atomic number	Electronic configuration		
		K	L	M
Sodium Na	11	2	8	1
Chlorine Cl	17	2	8	7

Question 2

A Complete the following :

1. Mendel's first law is known as the law of ....
2. The reaction of the covalent compounds are .... than that of ionic compounds.
3. Nuclear energy is used in medical field to ....
4. The unit that is used in measuring work is ....
5. At the end of the reaction, the concentration of the reactants is .... %

B Choose from column (B), (C) what suits it in column (A) :

(A)	(B)	(C)
1. The electric potential difference 2. Uranium 3. The alternating electric current	a. it has a variable intensity and direction b. coulomb / second c. unstable d. joule / coulomb e. it has a constant intensity and direction	f. ohmmeter. g. radioactive element. h. voltmeter. i. it is used in lighting and operating electric appliances.

Use symbols to express the results from the pollination between : Long stem green pod pea plant with another short stem yellow pod pea. Showing parents, gametes and first generation.

Question 3

A Write the scientific term for each of the following statements :

1. A substance that increases the speed of the chemical reaction without interfering in it or being consumed.
2. A science that researches the transmission of the hereditary traits from one generation to another by the studying the similarities and differences between the parents and their offspring.
3. The opposition that the electric current faces during its flow in the conductor.
4. They are parts of DNA on the chromosomes and control the hereditary traits of the individual.
5. The reaction between an acid and an alkali to from salt and water.

B Illustrate by balanced symbolic equations the following reactions :

1. The reaction of water with sodium.
2. The effect of heat on red mercuric oxide.
3. The reaction of sodium carbonate with diluted hydrochloric acid.

C Mahmoud bought a toy which is operating by electromotive force its value equals 6 volt, and he has five electric cells e.m.f of each cell is 2 volt, and he wanted to operate this toy. Explain how the connection of these cells is completed ? with drawing.

Question 4

A Put (✓) or (✗) in front of the following sentences :

1. The series of chemical activity is an arrangement of the metals in a descending order according to their atomic weight. ( )
2. Mendel removed the petals from flowers of pea plant to prevent the self-pollination. ( )
3. In electric cells and batteries, chemical energy is converted into electric energy. ( )
4. The iron element shares in composing thyroxin hormone. ( )

B Give reasons for :

1. Ahmed objected to keep the silver nitrates solution in an aluminium container.
2. Rheostat is used in some electric circuits.
3. The nucleus is the energy store.

C What is meant by ...?

1. Mendel's second law. 2. Hormones. 3. Chemical reaction.

19 Sohag Governorate

Answer the following questions :

Question 1

A Complete the following :

1. The .... apparatus is used to measure the electric current intensity.
2. The resistance that faces the flow of electric current in a conductor is known as the ....
3. .... are parts of DNA present on the chromosomes and control the hereditary traits of the individuals.
4. .... traits are not transmitted from one generation to another.

B Choose from column (A), what suits it in column (B) :

(A)	(B)
1. Catalyst	a. it is breaking up of bonds in the reactant molecules and formation of new bonds in the products molecules.
2. Chemical reaction	b. the hormone responsible for the appearance of male secondary sex characteristics.
3. The hormone	c. a chemical substance which changes the rate of reaction without being changed.
4. Testosterone	d. the chemical substance that controls and regulates the functions and the activities of most of body organs.
	e. chemical reactions in which one element substitutes another less active element in a solution of one of its compounds.

C A battery consists of three electric cells, the electromotive force of each cell is 2 volt. Calculate the e.m.f of the battery when the cells are connected in parallel.

Question 2

A Write the scientific term for each of the following statements :

1. The arrangement of metallic elements in a descending order according to the degree of their chemical activity.
2. The change in the concentration of the reactants and resultants in a unit time.
3. The electric current intensity is directly proportional to the potential difference between two terminals of a conductor at constant temperature.
4. It is the spontaneous decay of the atoms' nuclei of some radioactive elements that are present in nature in an attempt to achieve a more stable composition.

Choose the correct answer :

1. A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance ....
 a. oxidizing agent. b. oxidation. c. reduction.

2. .... gas evolves, when nitrogen pentoxide decomposes.
 a. Nitrogen b. Carbon dioxide c. Oxygen

3. Mendel's second law is known as the law of .... of hereditary factors.
 a. segregation. b. coulomb. c. independent assortment.

4. Which of the following traits is dominant in human being ? ....
 a. Curly hair. b. Narrow eyes. c. Attached ear lobe.

Compare between, the direct current and alternating current (Concerning the field of using only).

Question 3

Put (✓) in front of the correct answer or (X) in front of wrong one :

1. Radium and uranium are from the natural radioactive substances. ( )
2. In dynamo, the chemical energy changes into electric energy. ( )
3. Simple goiter is resulted due to thyroxin hormone deficiency. ( )
4. Pancreas secretes glucagon hormone to decrease the level of glucose in blood. ( )

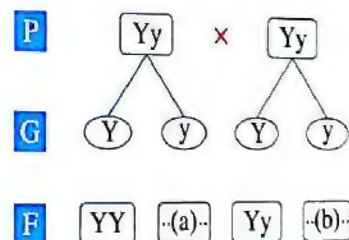
1. Find the unsuitable word :

The nature of the reactants – The concentration of the reactants – The substitution reaction – The temperature of reactants.

2. Mention the type of the chemical process in the following reaction.

$$Cl_2 + 2e^- \longrightarrow 2Cl^-$$

3. Complete the opposite diagram, that illustrates self-pollination between two pea plants of hybrid yellow seeds.



Illustrate by balanced symbolic chemical equation the following reaction :
The reaction of dil. hydrochloric acid with sodium hydroxide.

Question 4

A Correct the underlined words in the following statements :

1. Cosmic radiation is from **artificial** sources of radiation pollution.
2. The voltmeter is connected in **series** in the electric circuits.
3. Most metal carbonates decompose by heating into **metal** and carbon dioxide.
4. When adding silver nitrate solution to sodium chloride solution, a **blue** precipitate is formed

B Choose the correct answer from brackets, and put it in the suitable place in the following statements :

(sievert – ohm – hybrid – the principle of complete dominance – volt)

1. .... is the electric resistance of a conductor that 1 ampere is passed through it when the potential difference between its two terminals is 1 volt.
2. .... is the measuring unit of absorbed nuclear radiation.
3. The appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed, one of them carries a pure trait contrasting the trait carried by the other individual is known by ....
4. .... is the individual that carries the impure trait.

C Give a reason for :

The covalent compounds are slow in their chemical reactions.

20 Qena Governorate

Answer the following questions :

Question 1

A Complete the following :

1. Mendel's first law is called the law of ....
2. The potential difference between two terminals of a conductor is .... proportional to the intensity of the electric current passing through it at a constant temperature.
3. Chromosome is chemically composed of a nucleic acid called DNA which is combined with ....
4. .... energy is used in the drilling of petroleum and underground water.

B Put (✓) or (✗) in front of the following sentences :

1. Ovary secretes the progesterone hormone. ( )
2. Oxidation and reduction are two separated processes. ( )
3. When the amount of glucose decreases in the blood, pancreas secretes glucagon hormone. ( )
4. The reactions of ionic compounds are fast. ( )

C You have three similar electric cells, the electromotive force (e.m.f.) of each is 3 volt, show by drawing only how can you connect them together to obtain a battery of electromotive force (e.m.f.) of 6 volt ?

Question 2

A Write the scientific term for each of the following statements :

1. The breaking up of bonds between molecules of the reactants and formation of new bonds between the molecules of the products.
2. The opposition that the electric current faces during it passing through a conductor.
3. A chemical substance which changes the speed of a chemical reaction without being changed.
4. A device used to measure the electric current intensity passing in the electric circuit.

B Correct the underlined words :

1. In the chemical activity series, the metallic elements are arranged in a descending order according to their **atomic weights**.
2. Learning of walking in children is **a hereditary** trait.
3. The scientist **Mendeleev** is considered as the founder of heredity.
4. The chemical formula of nitrogen pentoxide gas is **NO_2**.

C Give a reason for :

The fridge is used to preserve food.

Question 3

A From the figures in front of you answer what is required below :

1. From two following figures		2. In the following figure
(A)	(B)	X The Kidney
A. In figure (A) the voltmeter is used to measure		A. The gland (x) is called .... gland.
B. In figure (B) the voltmeter is used to measure		B. The gland (x) is secretes .... hormone.

B **Cross out the unsuitable word (or the sentence) in the following :**

1. Radium – Zirconium – Iron – Uranium.
2. Free ear lobe – Wide eyes – Presence of freckles – Presence of dimples.
3. Current produced from electric generators – Current constant in intensity - Current constant in direction – Current is used in electroplating processes.
4. Genes are parts of the DNA – Genes are present in the cytoplasm – Every gene gives an enzyme – Genes control hereditary traits.

C **In the following reaction :**

$$H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$$

Determine the oxidizing agent and reducing agent ?

Question 4

A **Choose from column (B), what suits it in column (A) :**

(A)	(B)
1. The reaction of zinc with dilute hydrochloric acid is considered as	a. sievert.
2. The measuring unit of absorbed radiation is	b. ohm.
3. From the factors that affect the speed of the chemical reaction	c. concentration of reactants.
4. The measuring unit of the electric resistance is	d. simple substitution reaction.
	e. neutralization reaction.

B **Choose the correct answer :**

1. If a quantity of electricity of 20 coulombs passes in 10 seconds through a cross-section of a conductor, so the intensity of the electric current equals .... ampere.

   a. 200 b. 30 c. 10 d. 2

2. According to Mendel's second law, the dominant traits appear in the second generation at a percentage of .... %.

   a. 100 b. 75 c. 50 d. 25

3. The .... effects of radiation are results of changing the sex chromosomes in the cells.

   a. physical b. genetic c. cellular d. all the previous

4. The two scientists .... discovered the means of how the genes control the appearance of hereditary traits.

   a. Badel and Tatum b. Watson and Crick c. Badel and Crick d. Watosn and Badel

C **Illustrate by a balanced symbolic equation the following reaction :**

The effect of heat on sodium nitrate.

21 Luxor Governorate

Answer the following questions :

Question 1

A Complete the following :

1. Nuclear energy can be used in .... field to convert sand to silicon sheets.
2. Free ear lobe from the .... traits in human.
3. The .... apparatus is used to measure the resistance.
4. Mendel's first law is called ....

B What are the results of :

1. Reaction of hydrochloric acid with sodium hydroxide.
2. Deficiency of growth hormone secretion during childhood.
3. Adding a negative catalyst to a rapid reaction.
4. The pancreas secretes the insulin hormone.

C You have two currents, one of them is resulted from electrochemical cell and the other is resulted from electric generator, which of them you preferred ? Why ?

Question 2

A Choose the correct answer :

1. The oxygen gas evolves by the thermal decomposition of .... compound.
   a. $CaSO_4$ b. $CuCO_3$ c. HgO d. $Cu(OH)_2$
2. .... is the quantity of charge that transferred by a constant current intensity of one ampere in one second.
   a. Coulomb b. Volt c. Joule d. Ohm
3. Iron filings react with diluted hydrochloric acid faster than a piece of iron that has the same mass due to ....
   a. increasing of concentration. b. presence of catalyst.
   c. increasing of surface area. d. equal masses.
4. The sliding rheostat is used to .... in the electric circuit.
   a. measure potential difference b. change the resistance
   c. measure current intensity d. measure the e.m.f

B Correct the underlined words :

1. Hydrogen is considered the oxidizing agent in the reaction : $H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$
2. According to Mendel's first law, the ratio of one pair of hereditary traits in the second generation is 1 : 1
3. On adding silver nitrate solution to sodium chloride solution, a brown precipitate is formed.
4. The two factors of a hereditary trait are different in the pure individual.

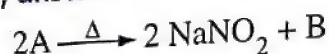
C Explain the relation between the cellular effects of the radiation and the blood hemoglobin ?

Question 3

A Write the scientific term for each of the following statements :

1. The measuring unit of the absorbed radiation by human body.
2. Ductless glands that secretes their hormones directly in the blood stream.
3. The current intensity passing through a conductor whose resistance is one ohm when the potential difference between its terminals is one volt.
4. The disease which is caused by the increase in the secretion of thyroxin hormone.

B 1. From the following equation, answer :



$$2A \xrightarrow{\Delta} 2\,NaNO_2 + B$$

1. write the chemical formula for (A)
2. write the name of gas (B)

2. Use symbols to express the results from the self-pollination of a hybrid yellow seeds pea plant :

1. showing parents, gametes and first generation.
2. write the final ratio.

C (1) Explain "oxidation and reduction are concurrent processes"

Question 4

A Mention one importance for :

1. Chemical reactions.
2. Air bags.
3. The peaceful uses of nuclear energy in medical field.
4. Ammeter.

B 1. You have three electric cells, the e.m.f. of each of them is 1.5 volt, show with drawing the total e.m.f. when connecting them :

1. in series.
2. in parallel.

2. Use symbols to express the mating between man with black hair (Bb) with a woman has light colour hair (bb), showing the parents, gametes and first generation.

C Give reason : Adding manganese dioxide powder to hydrogen peroxide solution.

22 Aswan Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. .... is used to generate an alternating electric current.
2. NaOH + ... ⟶ $NaCl + H_2O$
3. The presence of check dimples in human of the .... genetic traits.
4. Sodium chloride powder reacts .... than a cube of sodium chloride of the same mass.

B Choose from column (B), what suits it in column (A) :

A. Physical quantities	B. Measuring units
1. Electric resistance	a. Joule
2. Electromotive force	b. Ampere
3. Quantity of electricity	c. Coulomb
4. Work	d. Ohm
	e. Volt

C What happens when :

Heating of green copper carbonate (write the reaction chemical equation).

Question 2

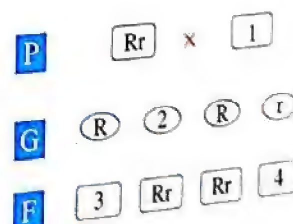
A Write the scientific term for each of the following statements :

1. When two individuals bearing a pair or more of contrasting traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 : 1
2. A chemical process in which the atom gains one electron or more.
3. The process of spontaneous decaying of atoms of some elements present in nature to reach a more stability.
4. The breaking up of bonds of the reactants molecules and the formation of new bonds in the products molecules.

B The following figure :

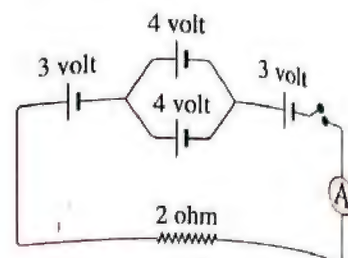
Show the process of self pollination in pea plant red hybrid flowers.

Replace the number in the figure with the appropriate symbols.



C **In the following electric circuit :**

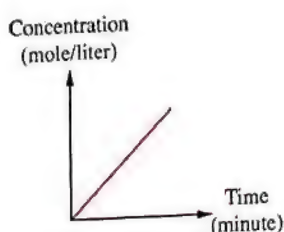
Calculate the reading of ammeter.



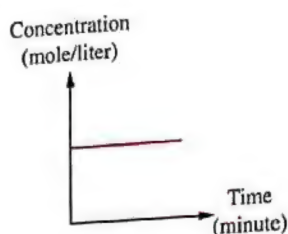
Question 3

A **Choose the correct answer :**

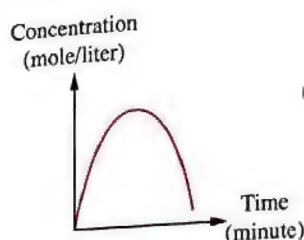
1. On adding sodium chloride solution to silver nitrate, a .... precipitate is formed.
   a. black b. red c. blue d. white
2. The volt equals ....
   a. $\frac{\text{coulomb}}{\text{ampere}}$ b. ampere × second c. $\frac{\text{joule}}{\text{coulomb}}$ d. $\frac{\text{coulomb}}{\text{second}}$
3. Genes control the appearance of a genetic traits of living organism by producing ....
   a. hormones b. enzymes c. fats d. vitamins
4. On the reaction of magnesium ribbon with diluted hydrochloric acid, then the figure .... represent the change occurs on the hydrochloric acid concentration.



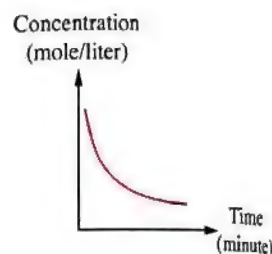
a.



b.



c.

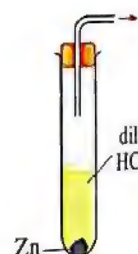


d.

B **Select the odd word in the following :**

1. Sodium – Potassium – Silver – Aluminium. (In terms of chemical activity)
2. Voltmeter – Ammeter – Ohmmeter – Barometer. (In terms of use in the electrical circuit)
3. Radium – Iron – Uranium – Rubidium.
4. Dwarfism – Gigantism – Diabetes – Cancer.

C **In the opposite figure :**



1. What is the name of the evolved gas ?
2. Mention the type of the chemical reaction.

Question 4

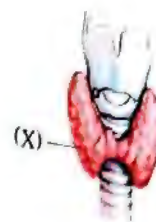
A **Correct the underlined words :**

1. Some radioactive materials are used as <u>**fossil**</u> fuel for a space rockets.
2. <u>**A catalyst**</u> is a substance which gives oxygen or takes away hydrogen during a chemical reaction.

3. The electric current intensity passing through a conductor is **inversely** proportional with the potential difference between its ends when the temperature is constant.
4. The **kinetic** energy is converted into electric energy in electric cells and batteries.

D In the opposite figure :

1. The name of (X) gland is ....
2. (X) gland is located in the front surface of the neck on both sides of the ....
3. (X) gland secretes .... hormone that plays a main role in the food assimilation processes in the human body.
4. The enlargement of the (X) gland causes human disease called ....



E What is the role of ?

Oxidase enzyme which is found in sweet potato in the decomposition of hydrogen peroxide.

23 Red Sea Governorate

Answer the following questions :

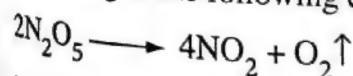
Question 1

A Complete the following sentences :

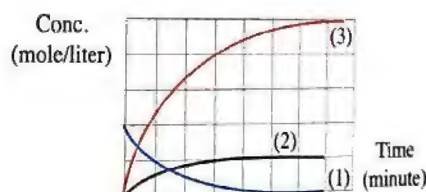
1. $2HgO \xrightarrow{\Delta}$ .... + ...
2. .... gland secretes thyroxin hormone.
3. On connecting two charged conductors, the electric current passes from the conductor with .... potential to the conductor which has .... potential.
4. Chromosome is chemically composed of a nucleic acid DNA which is combined with ....
5. In oxidation and reduction reactions, metals are considered .... factors, while nonmetals are considered .... factors.

B The opposite graph illustrates :

The decomposition of nitrogen pentoxide according to the following equation :



$2N_2O_5 \longrightarrow 4NO_2 + O_2\uparrow$



Replace the numbers on the figure by suitable substances from the equation.

C Resistance of a conductor is 22 ohm and the amount of electricity passing through it is 20 coulomb in 2 seconds.

Calculate the potential difference between the two terminals of this conductor.

Question 2

A Choose the correct answer :

1. Mendel covered .... of the pistile of a pea plant to avoid cross pollination.
   a. stamens b. sepals c. stigmas d. petals
2. On adding silver nitrate solution to sodium chloride solution .... precipitate is formed
   a. red b. blue c. black d. white
3. The hormone responsible for the appearance of male secondary sex characters is the .... hormone.
   a. estrogen b. testosterone c. insulin d. adrenalin
4. For measuring the electric resistance, the .... apparatus is used.
   a. rheostat b. ammetre c. ohmmeter d. voltmeter
5. .... are parts of DNA found in the nucleus of the cell.
   a. Genes b. Cytoplasm c. Gametes d. Hormones
6. The substance which changes the speed of the chemical reaction and doesn't change is known as ....
   a. oxidizing agent. b. catalyst. c. reducing agent. d. active agent.

B Compare between : Voltmeter apparatus and ammeter apparatus.

(according to symbol in the circuit – the way of connection in the circuit)

C Give reasons for :

1. The blue colour of copper sulphate disappears on putting a piece of magnesium ribbon in it.
2. Some electric cells are connected in the electric circuit in series.

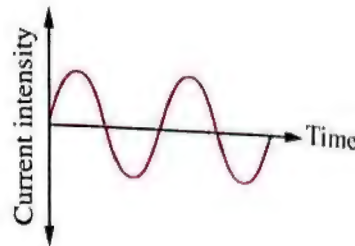
Question 3

A Write the scientific term of each of the following statements :

1. A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance.
2. The traits that are transmitted from one generation to another.
3. The reaction between an acid and an alkali to give salt and water.
4. The physical quantity which its measuring unit is equivalent joule/volt.
5. An arrangement of the metallic elements in a descending order according to the degree of their chemical activity.

D From the following figures :

(a)



(b)

1. What is the type of electric current in each figure ?
2. What is the source of the electric current in each figure ?

D What happen in the following cases ... ?

1. Putting a small piece of sodium in water (with writing the balanced equation).
2. Decrease of secretion of growth hormone in the childhood.

Question 4

A Correct the underlined words :

1. The reactions of ionic compounds are **slower** than that of the covalent compounds.
2. Most metal carbonates decompose by heating into **metal** and carbon dioxide.
3. The electric current intensity passing through a conductor is **inversely** proportional to the potential difference between two terminals of a conductor at a constant temperature.
4. Wide eyes are from the **recessive** traits in the human.
5. The radioactive phenomenon was discovered by the scientist **Watson**.

B Use the symbols (Y) and (y) to express the results of mating between two pea plants both of them have hybrid yellow seeds.

(showing parents – gametes – the ratio of resulting generation)

C Mention one importance or use for each of the following :

1. Nuclear energy in medical field. 2. Insulin hormone.

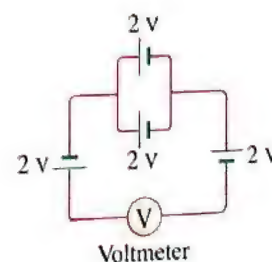
24 North Sinai Governorate

Answer the following questions :

Question 1

A Complete the following sentences :

1. From the opposite figure :
- Voltmeter reading = ... volt.
- When all the electric cells are connected in series, the reading of voltmeter = ... volt.



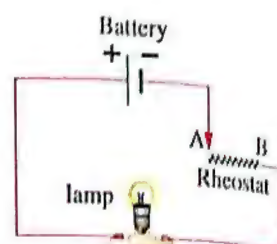
2. The name of the plant that Mendel chose to conduct his experiments is ....
3. The trait that appears in all individuals of the first generation in Mendel's experiments is called ....

B Write the scientific term of each of the following statements :

1. Organs secreting hormones in the human body.
2. A gland located below the brian and it consists of two lobes, each one secretes various types of hormones.
3. The breaking up of bonds of the molecules of the reactants and the formation of new bonds.
4. The catalyst that is used to slow down a chemical reaction.

C In the opposite figure :

What happens to the illumination of the lamp, when the slider of the rheostat moves from point A to point B and state the reason ?



Question 2

A Complete the following sentences :

1. The substance which gives oxygen or removes hydrogen is called ....
2. The change in the concentration of the reactants and products at a unit time is known as ....
3. The electric current is generated from a dynamo is a(an) .... current and this current is .... intensity and direction.

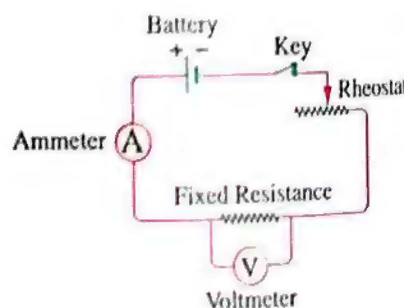
B Put (✓) or (✗) in front of the following statements :

1. Copper replaces gold in its salt solutions, while the opposite doesn't occur. ( )
2. The speed of chemical reaction decreases by increasing temperature. ( )
3. Electron is considered as an energy store of the atom. ( )
4. The bone marrow is the first to be affected by nuclear radiation. ( )

C In the shown figure in front of you :

If the reading of ammeter is 2 ampere and the reading of voltmeter is 8 volt calculate :

1. The value of resistance R.
2. The quantity of electricity passing through the circuit in one minute.



Question 3

A Choose the correct answer :

1. The radioactive phenomenon was discovered by the scientist ....
   a. Ohm. b. Becquerel. c. Ampere. d. Volt.
2. The flow of electric charges through a metal wire represents ....
   a. resistance. b. potential difference.
   c. electric current. d. current intensity.
3. The .... hormone liberates the needed energy from the food stuff.
   a. insulin b. calcitonin c. growth d. thyroxin
4. The hormone responsible for the appearance secondary sexual male characteristics is the .... hormone.
   a. progesterone b. testosterone
   c. estrogen d. adrenalin

B Complete the following sentences :

1. $HCl + NaOH \longrightarrow$ .... + ...
2. Sodium chloride powder reacts .... than a cube of sodium chloride which is equal in mass.
3. The .... traits are transmitted from one generation to another.
4. The genes are DNA parts present on the ....

C If you know that the two elements X and Y have an atomic number of 11 and 17 respectively.

Explain with the reasons which is an oxidizing agent and which is a reducing agent when forming a compound of them.

Question 4

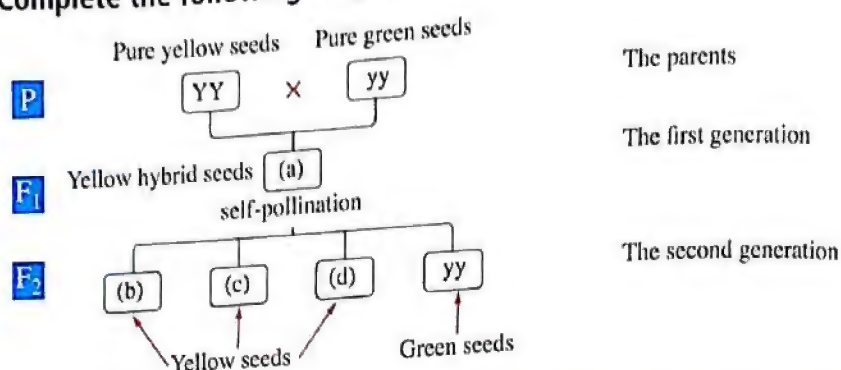
A Correct the underlined words :

1. Most metal carbonates decompose by heating into **metal** and carbon dioxide.
2. At the beginning of the reaction, the concentration of the reactants equals **50%.**
3. In the electric cell, **magnetic** energy is converted into electric energy.
4. The measuring unit of the **electric charge** is the Joule.

B First : Write the scientific term :

1. The electric current of constant intensity and direction.
2. The electric state of a conductor that shows the transference of electricity from and to it.

Second : Complete the following diagram :



C **Illustrate by balanced symbolic chemical equations the following reactions :**

1. The effect of heat on mercuric oxide.
2. Reaction of hydrochloric acid with the iron filings.

25 South Sinai Governorate

Answer the following questions :

Question 1

A **Write the scientific term of each of the following statements :**

1. The trait that appears in all individuals of the first generation in Mendel's experiments.
2. The cells in which chemical energy changes into electric energy.
3. Chemically composed of nucleic acid called DNA connected with protein.
4. The increase of the amount of nuclear radiation in the surrounding environment.

B **What happens when ...?**

1. Leaving the food outside refrigerator for a long period.
2. Deficiency secretion of growth hormone in childhood.
3. Adding dil. hydrochloric acid to a piece of zinc.
4. Decrease iodine salts in human food.

C **Calculate potential difference between two poles of a vacuum cleaner.**

Its resistance = 22 ohm and current intensity passes in it = 10 ampere.

Question 2

A **Put (✓) or (✗) in front of the following sentences :**

1. Iron rust is considered a fast reaction, while fireworks is considered a slow reaction. ( )
2. In dynamo, light energy changes into electric energy. ( )
3. Ammeter is used to measure current intensity passing in electric circuit. ( )
4. Most of metal carbonates decompose into metal and carbon dioxide on heating. ( )

B Complete the following sentences :

1. The substance that gives oxygen or takes hydrogen during chemical reaction is called ....
2. The founder of hereditary science is the scientist ....
3. Covalent compounds are slow in their chemical reactions, as the reaction occurs between ....
4. Each hereditary trait is controlled by two factors which separate during the formation of ....

C Illustrate with drawing the way of connection of three cells (e.m.f.) of each cell = 3 volt to obtain a battery its (e.m.f.) = 6 volt.

Question 3

A Choose the correct answer :

1. Pancreas secretes .... hormone that decreases blood glucose level.
   a. glucagon b. progesterone c. Insulin d. estrogen
2. When electric current passes through a cross-section of a conductor and current intensity = 2 ampere in 20 minute, so quantity of electricity passes = ... coulomb.
   a. 10 b. 2400 c. 40 d. 20
3. In tension case .... hormone increases.
   a. adrenalin b. thyroxin c. growth d. parathormone
4. Which of the following figures verify Ohm's law ? ....

(a)

(b)

(c)

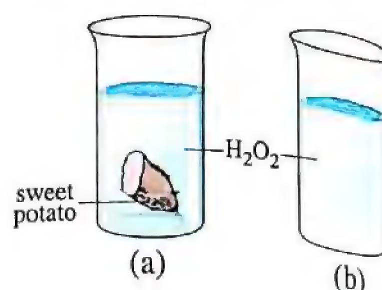
(d)

B Match from column (B), what suits (A) :

(A)	(B)
1. When adding silver nitrate solution to sodium chloride solution.	a. hereditary traits.
2. Learning swimming is from	b. red precipitate is formed.
3. When adding magnesium to copper sulphate	c. acquired traits.
4. Blood group is from	d. white precipitate is formed.
	e. no precipitate is formed.

C **The two opposite figures illustrate two beakers which contain equal amount of hydrogen peroxide, one beaker contains a piece of sweet potato :**

What is the gas produced from Hydrogen peroxide dissociation ?



Question 4

A **Cross out the odd word :**

1. Reactant nature – Products concentration – Reaction temperature – Catalysts.
2. $\frac{\text{coulomb}}{\text{second}}$ – Ampere – $\frac{\text{Joule}}{\text{coulomb}}$ – $\frac{\text{volt}}{\text{ohm}}$
3. Sodium – Lead – Copper – Aluminium. (According to chemical activity)
4. Uranium – Cesium – Barium – Radium.

B **Correct the underlined words :**

1. Ohmmeter is used to measure **potential difference** in an electric circuit.
2. Genotype of pea plant with yellow colored pod is **Yy**.
3. Transfer of electric charges between two conductors depends on **current intensity** of two conductors.
4. When mating (Bb × Bb), so Genotype (BB) may appears in offspring with ratio **50%**

C **Illustrate by balanced symbolic equation the effect of heat on sodium nitrate.**

26 New Valley Governorate

Answer the following questions :

Question 1

A **Write the scientific term of each of the following statements :**

1. The transferred charge by a constant current of intensity one ampere in one second.
2. The traits that can't be transmitted from one generation to another.
3. A chemical process causes the decrease in the percentage of oxygen in the substance.
4. The gland which is responsible for secretion of a hormone that regulates amount of water in the body.
5. Spontaneous decaying of atoms' nuclei of radioactive elements present in nature in an attempt to achieve a more stable composition.

B **By symbolic balanced chemical equations. Explain the following :**

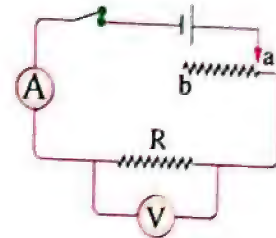
1. Heating of blue copper hydroxide.
2. The reaction between a small piece of sodium and water.

C Mention one importance or use for the following :

1. Nuclear energy in medical field.
2. Adrenalin hormone.
3. Ohmmeter device.

Question 2

A Choose the correct answer :



1. In the opposite closed electric circuit, when the slider of rheostat move from (a) to (b) the reading of voltmeter ....
   a. increases.
   b. decreases.
   c. doesn't change.
   d. equals the electromotive force of the battery.
2. All the following elements substitute hydrogen of dilute acid in ordinary conditions except ....
   a. Zn　b. Fe　c. Au　d. Al
3. Radioactivity phenomenon is discovered by scientist ....
   a. Ampere.　b. Mendel.　c. Ohm.　d. Becqueral.
4. .... hormone stimulates the release of glucose sugar from liver cells.
   a. Estrogin　b. Insulin　c. Glucagone　d. Calcitonin
5. From dominant traits in the human body is ....
   a. wide eye.　b. presence of freckles.　c. smooth hair.　d. absence of dimples.

B Compare between the following :

1.

Point of comparison	Testosterone hormone	Progesterone hormone
Importance		

2.

Point of comparison	Alternating current	Direct current
The source		

C You have three dry cells, the electromotive force for each one is 1.5 volt. Explain by drawing how to connect them to get a battery its electromotive force equals :

1. 1.5 volt
2. 3 volt
3. 4.5 volt

Question 3

A Complete the following :

1. $2\ NaNO_3 \xrightarrow{\Delta}$ .... $+ O_2\uparrow$
2. .... hormone regulates the rate of speed of growth of muscles and bones in the body.
3. The reaction between an acid and an alkali to form salt and water is known as .... reaction.
4. Mendel's second law is known as the law of ....
5. In the following reaction : $Cl_2 + 2e^- \longrightarrow 2Cl^-$
   chlorine is considered as .... agent.

B What happens in the following cases ...?

1. Lack of iodine salts in the water and food of human.
2. Putting a piece of sweet potato in a beaker containing a solution of hydrogen peroxide.
3. Touching of two charged electric conductors A and B where the electric potential of A is less than the electric potential of B.

C Explain on genetic bases :

Crossing between a pea plant with white flowers (rr) with another pea plant with red flowers (RR), showing :

(parents – gametes – first generation – second generation)

Question 4

A Correct the underlined words :

1. When adding silver nitrate solution to sodium chloride solution, a **red** precipitate of silver chloride is formed.
2. Nitrogen pentoxide gas decomposes into nitrogen dioxide gas and **nitrogen** gas.
3. The hormones in the human body are secreted by special organs called **duct** glands.
4. The measuring unit of absorbed radiation is **Newton**.
5. The genes control the appearance of hereditary traits of the living organism by producing **vitamins**.

B Give reasons for the following :

1. When heating of green copper carbonate, a black substance is formed.
2. The reactions of ionic compounds are faster than the reactions of covalent compounds.

3. Mendel removed the stamens from the flowers of pea plant before their anthers become mature when doing his experiments.

C Calculate the quantity of electricity passing through a conductor its resistance is 3 ohm for one minute if the potential difference between its terminals is 6 volt.

27 Matrouh Governorate

Answer the following questions :

Question 1

A Choose the correct answer :

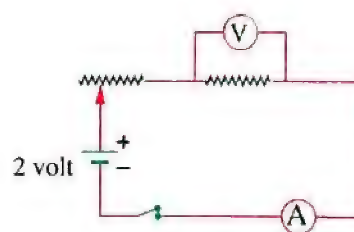
1. The thermal decomposition for copper sulphate gives copper oxide and ....
   a. sulpher dioxide. b. sulpher trioxide. c. oxygen. d. sulpher.
2. In the Mendel's second law, the alternative traits are inherited ....
   a. dependently. b. independently. c. interconnected. d. collectively.
3. When sodium atom loses an electron from its outermost energy level it becomes ....
   a. oxidized only. b. reducing agent only.
   c. oxidized and reducing agent. d. reduced.
4. The scientist who discovered radioactivity phenomenon was ....
   a. Ohm. b. Ampere. c. Becquerel. d. Mendel.
5. The ohmmeter is used to measure the ....
   a. electric potential. b. current intensity.
   c. quantity of electricity. d. electric resistance.

B Give reasons for for each of the following :

1. Although aluminium is more active than zinc, it takes more time than zinc to react with dilute hydrochloric acid.
2. It is preferred to use alternating current more than direct current.
3. Some elements are called radioactive elements.

C In the opposite figure :

If the quantity of electricity that passes through the electric circuit through 60 seconds is 30 coulomb.



Calculate :

1. The reading of ammeter (A)
2. The resistance of the wire (R).

Question 2

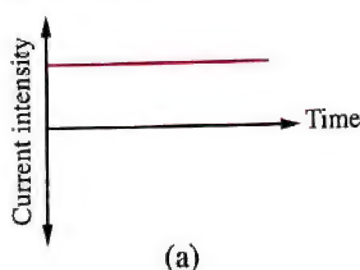
A Complete the following statements :

1. Sodium metal reacts with water producing sodium hydroxide and .... gas evolves.
2. Every gene gives a special .... which is responsible for occurrence of a chemical reaction.
3. The reactions of ionic compounds are .... than that of the covalent compounds.
4. The traits that are not transmitted from one generation to another are called .... traits.
5. $2N_2O_5 \longrightarrow$ .... $+ O_2$

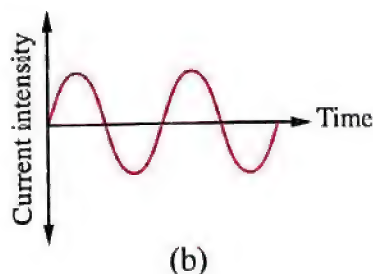
B Mention the importance of each of the following :

1. The variable resistance (the sliding rheostat).
2. Nuclear energy in the industrial field.
3. Oxidase enzyme in potato.

C Look at the following figures :



(a)



(b)

1. What is the type of the electric current represent by each graph ?
2. What is the name of the source that generates the current of each graph ?

Question 3

A Write the scientific term of each of the following statements :

1. The reaction between an acid and alkali to give salt and water.
2. The resistance of a conductor which allows passing of an electric current intensity of one ampere when the potential difference across its terminals is one volt.
3. Formed chemically form nucleic acid DNA and protein.
4. An arrangement of the metallic elements in a descending order according to their chemical activity.
5. Chemical substance organizes the most biological reactions inside living organisms.

B **Compare between each of the following :**

1. Physical effects and genetic effects (by giving an example).
2. Addition of hydrochloric acid to zinc and adding hydrochloric acid to copper.

(by chemical equations only)

C **If a black male mouse (BB) is crossed with a brown female mouse (bb) mention the colours and ratios of the resulting offspring in the first generation.**
Illustrate on hereditary bases.

Question 4

A **Rewrite the following statements after correcting the underlined words :**

1. On heating copper hydroxide, we obtain **copper and hydrogen**.
2. Mendel choose **ten** hereditary traits in the pea plant to perform his experiment.
3. The two scientists **Badel and Tatum** made a model for DNA molecule.
4. By using 3 gm of catalyst in an experiment its mass after finishing the reaction is **less than** gm.
5. The **chemical** energy can be converted to electrical energy by using dynamo.

B **What happened in the following cases ...?**

1. Increasing the concentration of reactants. (According to the speed of chemical reaction)
2. Adding silver nitrate solution to sodium chloride solution. (by chemical equation only)
3. The colour of red mercuric oxide when it is heated.

C **You have four similar cells the electromotive force of each 1.5 volt.**
Explain by using diagrams how can connect them to obtain a battery of e.m.f of :

1. 1.5 volt.
2. 3 volt.

SCIENCE

GUIDE ANSWERS

2022

SECOND TERM

BY A GROUP OF SUPERVISORS

Unit One

Lesson 1

1

1. d 2. d 3. b 4. d 5. b 6. d
7. a 8. d 9. a 10. a 11. c 12. c
13. a 14. d 15. c 16. a 17. a 18. a
19. c 20. b 21. b 22. b 23. a 24. b
25. a 26. c 27. d 28. b 29. c 30. a
31. b 32. a 33. c 34. b 35. c 36. a
37. b 38. a 39. d 40. c 41. b 42. b
43. a 44. d 45. b

2

1. C - d 2. A - c
3. D - a

3

1. metal oxide 2. sulphur trioxide
3. chemical activity. 4. $H_2\uparrow$
5. hydroxide 6. hydrogen
7. hydrogen gas 8. red
9. carbon dioxide 10. neutralization
11. white 12. loses
13. Reducing agent 14. Reduction
15. Copper oxide 16. Oxidation
17. $FeCl_2$

4

1. (✓)
2. (✗) ..... and sulphur trioxide gas.
3. (✗) ..... nitrite and oxygen .....
4. (✗) ..... slower than .....
5. (✓) 6. (✓)
7. (✗) ...... between the ions of ......
8. (✓) 9. (✓)
10. (✗) ...... a reduction process.
11. (✗) ...... is equal to ......
12. (✗) ...... gains an electron.
13. (✗) ...... loses an electron.
14. (✗) ...... concurrent processes.

5

1. Chemical reaction.
2. Thermal decomposition reactions.
3. Chemical activity series.
4. Simple substitution reactions.
5. Double substitution reactions.
6. Neutralization reaction.
7. Oxidation process.
8. Reduction process. 9. Oxidizing agent.
10. Reducing agent. 11. Oxidation process.

6

1. the chemical reaction.
2. water – carbon dioxide
3. thermal decomposition 4. metal – oxygen.
5. copper oxide – water vapour.
6. blue – black.
7. metal oxide – carbon dioxide.
8. black – green
9. oxygen – carbon dioxide.
10. blue – copper oxide.
11. Hydrogen – sulphur trioxide
12. sulphates – metal oxide
13. chemical activity series.
14. more – substituted
15. sodium hydroxide – hydrogen
16. simple substitution – double substitution
17. red – copper
18. Neutralization reaction
19. carbon dioxide – turbids
20. zinc chloride (salt of an acid).
21. Carbon dioxide – oxygen
22. a precipitate
23. white – silver chloride 24. copper.
25. a. oxidation – reduction
b. reducing – oxidizing
26. Oxidizing agent
27. Oxidation process.
28. a. Reduction – oxidizing
b. Oxidation – reducing
29. reduction 30. chlorine – sodium
31. loses 32. Oxidizing agent
33. Reducing agent
34. Oxidation – reduction 35. concurrent
36. reducing – oxidizing

7

Thermal decomposition reactions:

1. $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$
2. $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$
3. $CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$
4. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$
5. $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

6. $2NaN_3 \longrightarrow 2Na + 3N_2\uparrow$

Simple substitution reactions:

7. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$
8. $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$
9. $2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$
10. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$
11. $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

Double substitution reactions:

12. $HCl + NaOH \longrightarrow NaCl + H_2O$
13. $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$
14. $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

Oxidation and reduction reactions:

15. $CuO + H_2 \xrightarrow{\Delta} H_2O + Cu$
16. $2Na + Cl_2 \longrightarrow 2NaCl$

17. ${}_{11}Na \longrightarrow Na^+ + e^-$ oxidation reaction

8

1. Due to decomposition of red mercuric oxide by heating into mercury (silvery colour) and oxygen gas evolves.
$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$
2. Due to decomposition of blue copper hydroxide by heating into copper oxide (black) and water vapour.
$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$
3. Due to decomposition of blue copper sulphate by heating into copper oxide (black) and sulphur trioxide gas evolves.
$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$
4. Due to decomposition of green copper carbonate by heating into copper oxide (black) and carbon dioxide gas evolves.
$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$
5. Due to decomposition of white sodium nitrate by heating into sodium nitrite (yellowish white) and oxygen gas evolves.
$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$
6. To compare between elements in terms of the degree of their chemical activity, where the more active element replaces the less active one.
7. Because both aluminium and zinc can replace the hydrogen of an acid as they come before hydrogen in the chemical activity series.
$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$
$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$
8. Because copper comes after hydrogen in the chemical activity series so, it can't replace the hydrogen of an acid, but zinc comes before hydrogen so it can replace hydrogen of an acid.
$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$
9. Because gold comes after hydrogen in C.A.S. So, it can't replace the hydrogen of an acid.
10. Due to the presence of a layer of aluminium oxide on aluminium surface, which takes time to separate from aluminium that delays the starting of occurrence of the reaction.
11. Because it precedes hydrogen in C.A.S. So, it is more active than hydrogen.
12. Because magnesium is more active than copper as it comes before copper in chemical activity series, while copper comes after magnesium in C.A.S. So, it can't replace magnesium.
$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
13. Because magnesium precedes copper in C.A.S. so, it replaces copper in copper sulphate solution.
$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
14. Because magnesium comes before copper in chemical activity series, so it replaces copper in copper sulphate solution and copper precipitates as a red ppt.
$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
15. Because aluminium is more active than silver (as it comes before silver in the chemical activity series), so it substitutes silver in silver nitrate solution which leads to eroding of aluminium containers.
16. Because aluminium comes before hydrogen in C.A.S. so, it replaces hydrogen in diluted acids.
$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$
17. Due to formation of silver chloride salt which doesn't dissolve in water.
$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$
18. Because hydrogen takes oxygen away and reduces copper oxide to copper, while copper oxide gives oxygen and oxidizes hydrogen to water.
19. Because sodium atom loses an electron and changes into positive (+ve) ion, while chlorine atom gains an electron and changes into negative (–ve) ion.
20. Because this reaction occurs by losing and gaining electrons.
21. Because metals tend to lose electrons during the chemical reaction, while nonmetals tend to gain electrons during the chemical reaction.
22. Because the number of gained electrons in reduction process equals the number of lost electrons in oxidation process.

PART 1

9 1, 2. $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

3, 4, 5. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

6. $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

7, 8. $CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

9. $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

10. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$

- The required precautions : using a small piece of sodium, as sodium reacts with water strongly which leads to an explosion and burning.

11. $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

12. $2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

13, 14, 15, 16. $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

17. $HCl + NaOH \longrightarrow NaCl + H_2O$ (Neutralization reaction)

18. $Ca(OH)_2 + 2HCl \xrightarrow{dil.} CaCl_2 + 2H_2O$

19, 20. $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

21. $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

22. $2NaN_3 \xrightarrow[spark]{electric} 2Na + 3N_2\uparrow$

23, 24 : *Look at the main book on page* (27).

10 1. It is the breaking up of bonds in the molecules of the reactants and formation of new bonds in the molecules of the resultants (products) from the reaction.

2. They are chemical reactions which involve the breaking up of the compounds by the effect of heat into its primary elements or simpler compounds than the original ones.

3. It is the arrangement of metals in a descending order according to the degree of their chemical activity.

4. They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.

5. They are chemical reactions in which double substitution (exchange) occurs between the ions (radicals) of two different compounds to give two other new compounds.

6. It is a reaction between an acid and an alkali to form salt and water.

7. A chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance.

Or : A chemical process where the atom loses an electron or more during a chemical reaction.

8. A chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance.

Or : A chemical process where an atom gains an electron or more during a chemical reaction.

9. It is the substance which gives oxygen or takes hydrogen away during a chemical reaction.

Or : It is the substance which gains an electron or more during a chemical reaction.

10. It is the substance which takes oxygen away or gives hydrogen during a chemical reaction.

Or : It is the substance which loses an electron or more during a chemical reaction.

11 1. A silvery substance of mercury is formed and oxygen gas evolves.

$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

2. A black substance of copper oxide is formed and water vapour evolves.

$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

3. A black substance of copper oxide is formed and carbon dioxide gas evolves.

$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

4. A black substance of copper oxide is formed and sulphur trioxide gas evolves.

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

5. A yellowish white substance of sodium nitrite is formed and oxygen gas evolves.

$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

6. Sodium substitutes the hydrogen of water, giving (NaOH) and hydrogen gas evolves which burns with a strong pop sound and this reaction accompanied by heat releasing.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$

7. No reaction occurs.

8. Zinc reacts with dilute HCl immediately and hydrogen gas evolves.

$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

9. Sodium hydroxide reacts with hydrochloric acid forming sodium chloride (salt) and water.

$NaOH + HCl \longrightarrow NaCl + H_2O$

10. H_2O evaporates and NaCl (table salt) remains.

11. An effervescence happens due to evolving of bubbles of carbon dioxide gas.

$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

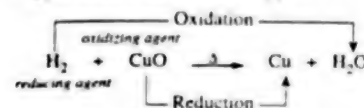
12. A white ppt. of silver chloride is formed.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

13. The blue colour of copper sulphate disappears and a red ppt. of copper is formed.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

14. Hydrogen is oxidized into water, while copper oxide is reduced into copper.



15. It is oxidized and changed into positive (+ve) sodium ion and it became a reducing agent.

$Na \xrightarrow{Oxidation} Na^+ + e^-$

16. It is reduced and changed into a negative ion and it became an oxidizing agent.

12 1.

Thermal decomposition of copper hydroxide	Thermal decomposition of copper sulphate
Blue copper hydroxide decomposes by heat into copper oxide (black) and water vapour. Ex. : $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$	Blue copper sulphate decomposes by heat into copper oxide (black) and sulphur trioxide gas evolves. Ex. : $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

2.

Heating of metal oxide	Heating of metal hydroxide
Metal oxide decomposes by heat into metal and oxygen gas evolves. Ex. : $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$	Metal hydroxide decomposes by heat into metal oxide and water vapour. Ex. : $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

3. *Look at the main book on page* (27).

4.

Oxidizing agent	Reducing agent
It is the substance which gains an electron or more during a chemical reaction. Or It is the substance which gives oxygen or takes hydrogen away during a chemical reaction.	It is the substance which loses an electron or more during a chemical reaction. Or It is the substance which takes oxygen away or gives hydrogen during a chemical reaction.

5.

P.O.C.	Traditional concept	Electronic concept
Oxidation process :	A chemical process which causes the increase in the O_2 percentage or the decrease in the H_2 percentage in a substance.	A chemical process where the atom loses an electron or more during a chemical reaction.
Reduction process :	A chemical process which causes the decrease in the O_2 percentage or the increase in the H_2 percentage in a substance.	A chemical process where the atom gains an electron or more during a chemical reaction.

13 1. • **Magnesium :** It reacts with dil. HCl and hydrogen gas evolves.

• **Copper :** No reaction occurs.

2. • **Copper sulphate :** It reacts with zinc forming zinc sulphate and a red precipitate of copper.

• **Magnesium sulphate :** No reaction occurs.

3. • **Silver nitrate :** It reacts forming a white precipitate of silver chloride.

• **Sodium nitrate :** No precipitate is formed.

14 1. *Answer by yourself.*

2. (a) It is considered one of the most important safety means in cars at emergencies.

(b) *Look at the main book on page* (18).

3. (a) [A] NaCl. [B] $NaNO_3$

(b) Oxygen gas, by approaching a burning match, the glowing of match increases.

(c) AgCl – white ppt.

4. (a) [A] $Cu(OH)_2$ [B] H_2 [C] Cu
(b) ① Thermal decomposition reaction.
② Simple substitution reaction.
③ Oxidation and reduction reaction.
(c) Reduction process, because oxygen is taken away from it.

5. (a) Hydrogen gas – Simple substitution reaction (A metal substitutes the hydrogen of diluted acids).
(b) Because iron comes before hydrogen in C.A.S. so, it replaces hydrogen in diluted hydrochloric acid.

6. *Look at the main book on page* **(22)**

7. (a) $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
(b) $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

8. (a) $NaOH + HCl \longrightarrow NaCl + H_2O$
Double substitution reaction (neutralization reaction)
(b) A white ppt. of silver chloride is formed.
$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

9. (a) Zinc is more active than copper (as it comes before copper in the chemical activity series), so it substitutes copper in copper sulphate solution forming a red precipitate of copper.
(b) Simple substitution reaction.

10. (a) $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$
(b) $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

11. (a) Reduction process.
(b) Oxidation process.
(c) Oxidation: H_2 → H_2O; Reduction: CuO → Cu

$H_2 + CuO \xrightarrow{\Delta} Cu + H_2O$

H_2: Reducing agent; CuO: oxidizing agent

(d) Because black copper oxide gives oxygen and oxidizes hydrogen into water, while hydrogen takes oxygen and reduces copper oxide into copper.

12. (a). (✗) (b). (✗) (c). (✓) (d). (✓)

13. Oxidation: 2Na → $2Na^+$; Reduction: Cl_2 → Cl^-

$2Na + Cl_2 \longrightarrow 2Na^+Cl^-$

2Na: Reducing agent; Cl_2: Oxidizing agent

- Each (Na) atom loses one electron.
- Each (Cl) atom gains one electron.

14. - Oxidation : It is a chemical process where the atom loses an electron or more.
- Reduction : It is a chemical process where the atom gains an electron or more.
- Reducing agent : Magnesium (Mg), because it loses two electrons during the chemical reaction and changes into a positive magnesium ion.
$Mg \xrightarrow{Oxidation} Mg^{+2} + 2e^-$
- Oxidizing agent : Chlorine (Cl), because it gains one electron during the chemical reaction and changes into a negative chloride ion.
$Cl_2 + 2e^- \xrightarrow{Reduction} 2Cl^-$

15. (a) $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
Simple substitution reaction (oxidation and reduction).
(b) – Oxidizing agent : Copper ion (Cu^{+2}), because it gains two electrons during the chemical reaction and changes into copper atom
$Cu^{+2} + 2e^- \xrightarrow{Reduction} Cu$
– Reducing agent : Magnesium atom (Mg), because it loses two electrons during the chemical reaction and changes into magnesium ion (Mg^{+2})
$Mg \xrightarrow{Oxidation} Mg^{+2} + 2e^-$

16. (a) Copper, the others are metals come before hydrogen in the C.A.S
(b) A chemical process in which the atom loses an electron or more, the others are reduction processes.

15 1. (a) - Before heating :
Tube (A) : Red Tube (B) : White
- After heating :
Tube (A) : Silver
Tube (B) : Yellowish white
(b) Oxygen gas / by approaching a burning match, the glowing of match increases.

2. (a) Thermal decomposition reaction.
(b) Copper carbonate
(c) $CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$
(d) By passing CO_2 into clear limewater for a short time, it becomes turbid.

3. (a) Correct. (b) Incorrect. (c) Correct.
(d) Incorrect. (e) Correct. (f) Incorrect.
(g) Incorrect.

4. more active → Na | Ca | Al | Fe | Sn | Pb → less active

5. (a) - Hydrogen gas (H_2).
- By using a lighted splint, it burns with a pop sound.
(b) - $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$
- Simple substitution reaction.
(c) No reaction occurs, because copper is less active than hydrogen as it comes after hydrogen in C.A.S., so it cannot replace hydrogen in diluted acids.

6. (a) Hydrogen (H_2).
(b) Sodium chloride (NaCl).
(c) Tube (A) : Simple substitution reaction.
$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$
Tube (B) : Double substitution reaction.
$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

7. (a) Carbon dioxide gas.
(b) By passing CO_2 into clear limewater for a short time, it becomes turbid.
(c) $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$
- Double substitution reaction (Reaction between an acid and a salt)

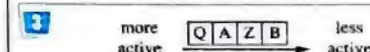
8. (a) A white ppt. of silver chloride is formed.
$NaCl + AgNO_3 \xrightarrow{dil.} NaNO_3 + AgCl\downarrow$
(white ppt.)
(b) A black substance of copper oxide is formed.
$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

9. (a) It changes from black colour into red colour, because hydrogen takes oxygen from black copper oxide forming red copper element and water vapour.
(b) *Answer by yourself.*

Thinking Skills Questions

1 1. b 2. c 3. a 4. c

2 1. Because the metal element loses electron or more and turns into positive ion (as a reducing agent) this electron(s) gained by the non-metal element which turns into negative ion (as an oxidizing agent), then both positive ion and negative ion are attracted together forming ionic compound.
2. Because this reaction represent a double substitution reaction, which occurs only between two ionic compounds, but water is a covalent compound, and table salt is an ionic compound, so water dissolves table salt to form salty solution.

3

more active → Q | A | Z | B → less active

4 Copper – Because :
in tube (1) :

$Cu + FeSO_4 \longrightarrow$ no reaction
in tube (2) :

$Cu + CaSO_4 \longrightarrow$ no reaction
in tube (3) :

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

5 1. $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$
$H_2 + CuO \xrightarrow{\Delta} Cu + H_2O\uparrow$
2. $Na + H_2O \longrightarrow NaOH + H_2\uparrow + heat$
$NaOH + HCl \xrightarrow{dil.} NaCl + H_2O$
then heating to evaporate water.
3. 1st method :-
$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
2nd method :-
$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$
$H_2 + CuO \xrightarrow{\Delta} Cu + H_2O\uparrow$

6 C.

7 (a) ④ CuO ⑤ $H_2\uparrow$ ⑥ Cu
(b) ① Thermal decomposition reaction.
② Simple substitution reaction (A metal substitutes the hydrogen of water).
③ Oxidation and reduction reaction.

PART 1

Lesson 2

1

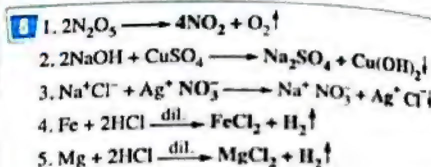
1. d	2. a	3. d	4. a	5. a	6. a
7. c	8. d	9. c	10. c	11. d	12. b
13. b	14. a	15. c	16. c	17. a	18. a
19. b	20. d	21. c	22. d	23. d	24. b
25. b	26. d	27. c	28. a	29. a	30. c

2 1. petroleum oil 2. Fireworks 3. oxygen
4. concentration 5. 100 % 6. faster
7. ions 8. surface area. 9. $FeCl_2$
10. is greater than 11. increases.
12. equal 13. negative catalytic
14. positive catalysts. 15. increasing

3 1. (✓)
2. (✗) ..... of copper hydroxide precipitate.
3. (✗) ..... slower than .....
4. (✗) ..... faster than .....
5. (✓) 6. (✓)
7. (✗) ...... and oxygen gas evolves.
8. (✗) ...... manganese dioxide.
9. (✓) 10. (✓)

4 1. The speed of chemical reaction.
2. Ionic compounds. 3. Catalyst.
4. Positive catalyst.
5. Negative catalyst.
6. Positive catalytic reactions.
7. Manganese dioxide.
8. Enzymes.
9. Oxidase enzyme.
10. Catalytic converter.

5 1. rusting of iron.
2. very slow – very fast
3. 100
4. decreases – increases. 5. zero% – 100%
6. the speed of chemical reaction.
7. nitrogen dioxide – oxygen 8. 100% – zero%
9. disappearance – appearance
10. blue – copper sulphate solution – blue precipitate
11. nature of reactants – concentration of reactants – temperature of the reaction – catalysts.
12. the kind of bonding in reactants – the surface area of reactants exposed to reaction.
13. slow. 14. faster
15. molecules – ions.
16. slower – surface area 17. faster
18. increases 19. increases
20. catalyst.
21. beginning – stopping.
22. positive catalysts.
23. positive catalytic – negative catalytic
24. manganese dioxide – sweet potato.
25. Oxidase – catalyst
26. catalytic converter
27. a catalytic – platinum

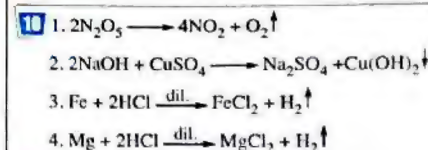
6

1. $2N_2O_5 \longrightarrow 4NO_2 + O_2\uparrow$
2. $2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2\downarrow$
3. $Na^+Cl^- + Ag^+NO_3^- \longrightarrow Na^+NO_3^- + Ag^+Cl^-\downarrow$
4. $Fe + 2HCl \xrightarrow{dil.} FeCl_2 + H_2\uparrow$
5. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

7 1. Because it takes place between ions that are resulted from dissociation of each of them in water.
$Na^+Cl^- + Ag^+NO_3^- \longrightarrow Na^+NO_3^- + Ag^+Cl^-\downarrow$
2. Because the reactions of ionic compounds take place between ions, while the reactions of covalent compounds take place between molecules
3. Due to increasing the number of molecules of reactants exposed to reaction
4. Because the surface area of iron filings exposed to reaction with acids is more than the surface area of iron piece, and as speed of chemical reaction increases by increasing the surface area
5. Because the speed of chemical reaction increases by increasing the surface area exposed to reaction.
6. Due to increasing the speed of the chemical reaction by increasing the concentration of oxygen gas.
7. Because by increasing the number of reactant molecules, the number of probable collisions between them increases.
8. Because the number of molecules of hydrochloric acid in concentrated solution is more than that in its diluted solution which leads to increasing the number of probable collisions between reactant molecules, so the speed of chemical reaction increases.

9. Due to increasing the number of probable collisions between reactant molecules.
10. Because the speed of reactions of cooking food increases by rising temperature.
11. Because the low temperature in the fridge (freezer) slows down the speed of the chemical reactions done by bacteria which cause the rot of food.
12. To change the rate of chemical reactions.
13. Because manganese dioxide acts as a catalyst which increases the speed of decomposition of hydrogen peroxide into water and oxygen.
14. Because the oxidase enzyme in sweet potato acts as a catalyst which increases the rate of decomposition of hydrogen peroxide into water and oxygen.

8 1. The speed of the chemical reaction increases due to increasing the surface area of reactants exposed to reaction.
2. The chemical reaction will end and the concentration of products becomes 100%.
3. The blue colour of copper sulphate disappears and blue precipitate of copper hydroxide is formed.
$2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2\downarrow$
blue ppt.
4. The number of reacting molecules increases and the rate of the reaction increases.
5. The speed of the chemical reaction increases.
6. The rate of the chemical reaction increases.
7. An effervescence happens, and the effervescence occurred in case of hot water is faster than in case of cold water.
8. The speed of the chemical reaction increases.
9. The number of collisions between molecules increases.
10. Food goes rotten due to the chemical reaction done by bacteria.
11. The speed of the chemical reaction increases.
12. The speed of this reaction will be decreased.
13. The rate (speed) of decomposition of hydrogen peroxide into water and oxygen increases.

9 1. It is the change in the concentration of the reactants and resultants at a unit time.
2. It is a chemical substance which changes the rate of the chemical reaction without changing or being used up.
3. They are chemical reactions in which the catalyst increases their speeds.
4. They are chemical reactions in which the catalyst decreases their speeds.
5. They are chemical substances produced by the body of living organism, act as catalysts that increase the speed of the biological reactions.

10

1. $2N_2O_5 \longrightarrow 4NO_2 + O_2\uparrow$
2. $2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2\downarrow$
3. $Fe + 2HCl \xrightarrow{dil.} FeCl_2 + H_2\uparrow$
4. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

11 1. It changes (increases or decreases) the speed of chemical reactions.
2. A positive catalyst that increases the speed of decomposition of hydrogen peroxide.
3. They act as catalysts that increase the speed of biological reactions.
4. It increases the speed of decomposition of hydrogen peroxide.
5. It helps in the treatment of harmful gases emitted from the car engine.

12 1.

Covalent compounds	Ionic compounds
• They are slow reacting compounds because they don't break up into ions.	• They are fast reacting compounds because they break up into ions.
• The reaction takes place between molecules.	• The reaction takes place between ions.

2. The reaction of dil. hydrochloric acid with iron filings is faster than its reaction with iron piece has the same mass.
3. *Look at the main book on page (63).*

13 1. *Look at the main book on page (59).*
2. *Look at the main book on pages (60 & 61).*
3. *Look at the main book on page (62).*
4. *Look at the main book on pages (64 & 65).*
5. *Look at the main book on pages (65 & 66).*

14 1. & 2. ***Look at the main book on page (57).***
3. ***Look at the main book on page (64).***
4. ***Look at the main book on page (66).***

15 1. • The first method : By adding silver nitrate solution, if a white ppt. is formed.
∴ The solution is sodium chloride :
$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$ white ppt.

• The second method : By adding copper sulphate solution, if a blue ppt. is formed.
∴ The solution is sodium hydroxide.
$2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2\downarrow$ blue ppt.

2. 1[st] way by using iron filings instead of a cube of iron.
2[nd] way by using concentrated HCl acid instead of diluted HCl acid.

3. (a) Sodium sulphate Na_2SO_4
(b) Copper hydroxide $Cu(OH)_2$ – blue ppt.
(c) By the disappearance rate of the blue colour of copper sulphate (reactant) or the appearance rate of the blue precipitate of copper hydroxide (product).
(d) A black substance of copper oxide is formed and water vapour evolves.
$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

4. (a) Zinc chloride ($ZnCl_2$)
(b) 1. The rate of the reaction decreases.
2. & 3. The rate of the reaction increases.

5. (a) Manganese dioxide.
(b) Positive catalytic reactions, because the catalyst increases the speed of the reaction.
(c) No, because no chemical change or decrease in mass occurs to the catalyst after ending the reaction.
(d) By adding oxidase enzyme that exists in sweet potato.

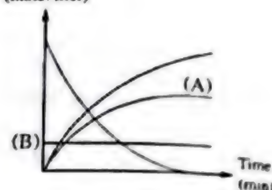
6. ***Look at the main book on page (59).***

16 1. ① X ② Z ③ Y
2. (a) ① AB_2 ② B ③ A
(b) It increases gradually.
(c) 1. At the end of the reaction.
2. At the beginning of the reaction.
3. At the end of the reaction.
4. At the beginning of the reaction.

3. (a) 1. C & D 2. A 3. B
(b) 4

4. ① HgO, because it represents the reactant substance, where its concentration at the beginning of the reaction is the largest.
② O_2, ③ Hg, because they represent the resultants, where their concentration at the end of the reaction is the largest.

5. (a) zero (b) O_2
(c)



6. (a) $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$
(b) ① Sodium nitrate. ② Oxygen gas.
③ Sodium nitrite.

7. (a) $2NaN_3 \xrightarrow[\text{Spark}]{\text{Electric}} 2Na + 3N_2\uparrow$
(b) ① Nitrogen gas. ② Sodium
③ Sodium azid.
(c) It is one of the most important safety means in cars at emergencies.

8. ① N_2O_5 ② O_2 ③ NO_2

9. The speed of this reacion is measured practically by :
– The disappearance rate of the blue colour of copper sulphate solution (reactant).
Or
– The rate of formation of the blue precipitate of copper hydroxide (resultant).

10. (a) Because silver comes after (H) in C.A.S.
(b) Due to the presence of a layer of aluminium oxide, which takes time to be removed by the acid.
(c) The reaction becomes faster, due to the increase of the surface area.
(d) Hydrogen gas.

11. (a) 3
(b) Because zinc comes before iron in C.A.S. and the iron filling has surface area much more the iron cube.

12. C > A > B
Because the speed of the chemical reaction increases by increasing the temperature of the reaction.

13. (a) Oxygen gas.
(b) By approaching a burning match, the glowing of match increases.
(c) In beaker (B), because sweet potato contains oxidase enzyme which increases the speed of decomposition of hydrogen peroxide into water and oxygen.

14. ***Look at the main book on pages (56 & 57).***

Thinking Skills Questions

1 1. a 2. a

2 **First experiment :** figure (B)
Second experiment : figure (C)
Because the volume of the H_2 gas in figure(c) is more than that in figure (B) during the same period of time (3 min.), where the speed of the chemical reaction depends on the surface area of the reactants exposed to the reaction.

3 (a) 1. ③ 2. ② 3. ①
(b) Using equal masses of iron and also equal concentrations and amounts of hydrochloric acid at constant temperature, at which the reaction occurs.

4 In the jar containing atmospheric air, because it contains 21% oxygen gas.

Project On UNIT One *Answer by Yourself*

Unit Two

Lesson 1

1

1. c	2. c	3. a	4. a	5. b	6. a
7. b	8. d	9. d	10. a	11. b	12. c
13. c	14. b	15. d	16. a	17. b	18. a
19. d	20. b	21. c	22. b	23. b	24. a
25. b	26. a	27. b	28. d	29. c	30. c
31. a	32. c	33. d	34. c	35. c	36. c
37. b	38. b	39. d	40. b	41. a	42. b
43. b	44. a	45. c	46. b	47. a	48. b
49. d	50. d	51. a	52. b	53. b	54. b

2 (1) 1. a 2. e 3. c 4. b
(2) 1. d 2. a 3. b

3 1. Coulomb 2. Coulomb
3. Coulomb. 4. volt
5. joule. 6. III
7. parallel 8. voltmeter
9. ohmmeter 10. Sliding rheostat
11. series.
12. electric potential difference 13. Volt
14. potential difference
15. The electric resistance
16. no current passes in the circuit (the circuit is open)
17. Electric potential 18. 1 ohm.
19. zero. 20. $R = \frac{V}{I}$
21. 3 Ohm. 22. decreases.

4 1. Protons. 2. Electrons.
3. The electric current. 4. The coulomb.
5. The ampere. 6. The ampere.
7. The electric current intensity.
8. Ammeter. 9. Sliding rheostat.
10. Electric transformer.
11. The electric potential of a conductor.
12. The potential difference across two terminals of a conductor.
13. The volt.
14. The electromotive force. 15. The volt.
16. The Joule. 17. Voltmeter.
18. Rheostat.
19. The electric resistance. 20. The ohm.
21. The variable resistance (Sliding rheostat).
22. Ohmmeter. 23. Ohm's law.
24. The resistance of a conductor.

25. The potential difference
26. The volt.
27. The ampere.

5
1. current intensity – electric resistance.
2. electric negative charges (electrons).
3. Current intensity × Time.
4. coulomb.
5. closed.
6. 9 ampere.
7. Ammeter – ampere.
8. high – low.
9. potential difference – amount of electric charges.
10. equal.
11. The voltmeter.
12. The potential difference – volt.
13. series – parallel.
14. Ampere – Second.
15. one joule – one coulomb
16. Voltmeter – volt.
17. voltmeter.
18. ammeter – ohmmeter.
19. the electromotive force.
20. Voltmeter – electromotive force.
21. voltmeter – ammeter
22. electric resistance.
23. Ohmmeter
24. ohm.
25. Sliding rheostat
26. current intensity – potential difference.
27. fixed resistance – the variable resistance (Sliding rheostat).
28. 1 ohm.
29. [symbols of the fixed and the variable resistance]
30. high – porcelain.
31. increases – decreases.
32. The resistance
33. potential difference – current intensity – electric resistance.
34. directly
35. inversely – directly
36. 6 volt – 3 amperes.
37. $\frac{V}{I}$
38. 10 volt.

6 a. 6 b. 1.5 c. 3.6

7
1. Because it doesn't pollute the environment.
2. Due to the attraction force between the protons in the nucleus and these electrons.
3. To measure the electric current intensity.
4. Due to the difference in their potential.
5. Because the electric current transfers from high potential to low potential.
6. Because the electric current intensity passing through a conductor is directly proportional to the potential difference across it.
7. Because there is no potential difference between them (potential difference = zero).
8. To measure the potential difference between its terminals.
9. To measure the electromotive force of the battery.
10. Because it will measure the e.m.f of the battery.
11. To convert the high electric voltage into a smaller voltage and get a suitable electric potential to charge the mobile.
12. To control the electric current intensity in the electric circuit and consequently the electric potential difference between its ends.
13. That by changing the length of the metallic wire coil by moving the flexible copper sheet (slider).

8
1. It is the flow of electric negative charges (electrons) through a conductor.
2. It is the quantity of electric charges flowing through a cross-section of the conductor in one second.
3. It is the electric current intensity passing through a circuit when a quantity of charge of one coulomb passes through a given cross-section in a time of one second.
4. It is the quantity of charge transferred by a constant current of intensity equals one ampere in a time of one second.
5. It is the state of an electric conductor that shows the transfer of the electricity from or to it, when it is connected to another conductor.
6. It is the value of the work done to transfer a quantity of charge (one coulomb) between the two terminals (poles) of this conductor.
7. It is the potential difference across two terminals of a conductor on doing a work of one joule to transfer a quantity of charge of one coulomb.
8. It is the potential difference between two poles of the battery when the electric circuit is open (no current passes through the circuit).
9. It is the opposition that the electric current faces during its passing through a conductor.
10. It is the resistance of a conductor that has an electric current of one ampere passing through it, when the potential difference between its terminals is one volt.
11. The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.

9
1. This means that the electric current intensity passing through this conductor equals 4 ampere.
2. This means that the quantity of electric charge that passes through a conductor in one second equals 2 coulomb.
3. *Answer by yourself.*
4. This means that the potential difference across two points of a conductor is 5 volt.
5. This means that the potential difference between the two poles of the car battery when the electric circuit is open is 12 volt.
6. This means that the potential difference across the conductor is equal 220 volt.
7. This means that the electric current intensity passing through this conductor equals 2 ampere.
8. This means that the potential difference across the two terminal of the conductor equals 5 volt.
9. This means that the resistance of this conductor equals 5 ohm.
10. This means that the electric resistance of a conductor equals 20 ohm.

10
1. It is used for measuring the current intensity.
2. - It is used for measuring the potential difference across two ends of a conductor.
   - It is used for measuring the electromotive force of the battery.
3. It is used for measuring the electric resistance.
4. It is used to control the current intensity and the potential difference in the different parts of the circuit.
5. It is used to reduce the electric potential.

11
1. The electrons in the outer level will leave the atom and become free.
2. The electric current intensity increases to double its value.
3. The electric current intensity decreases to its half value.
4. The electric current will flow from the conductor that has the higher electric potential to the other that has lower electric potential.
5. No electric current will pass through them.
6. No flowing of the electric current through the conductor (AB), because their is no potential difference between (A) and (B).
7. The electric current will pass from the second conductor (30 volt) to the first conductor (10 volt).
8. The resistance increases and the current intensity decreases.
9. The electric current intensity increases.
10. The current intensity is doubled.
11. The ammeter reading decreases and the voltmeter reading decreases, where ($V \propto I$).
12. The electric current will not pass in the circuit (opened circuit), so the reading of ammeter = zero and the reading of voltmeter is equal to the electromotive force of the battery.
13. An electric current is generated and will passes through the circuit.

12
1. *Look at the main book on page* (100).
2.

Electric current	Current intensity
It is the flow of electric negative charges (electrons) through a conducting material (as a metal wire).	It is the quantity of electricity in coulomb or the electric charges flowing through a cross-section of the conductor in one second.

3.

Points of comparison	Current intensity (I)	Potential difference (V)	Electric resistance (R)
• Definition:	It is the quantity of the electric charges flowing through a cross-section of the conductor in one second.	It is the value of the work done to transfer a quantity of charge (one coulomb) across the two ends of this conductor.	It is the opposition that the electric current faces during its passing through a conductor.
• Apparatus used :	Ammeter.	Voltmeter.	Ohmmeter.

4.

Ampere	Volt
It is the electric current intensity passing through a circuit when a charge of one coulomb passes through a wire in one second.	It is the potential difference across two terminals of a conductor on doing a work of one joule to transfer a quantity of charge of one coulomb.

13 1. & 2. *Look at the main book on pages* (104 & 105).

14 1. $I = \frac{q}{t} = \frac{5400}{5 \times 60 \times 60} = 0.3$ ampere.

2. $I = \frac{q}{t} = \frac{2400}{5 \times 60} = 8$ ampere.

3. $q = I \times t = 18 \times (7 \times 60) = 7560$ coulomb.

4. $t = \frac{q}{I} = \frac{25}{5} = 5$ second.

5. $I = \frac{q}{t} = \frac{20}{4} = 5$ amp.

• Ammeter – It is connected in series in the electric circuit.

6. $R = 2200$ ohm. $t = 2 \times 60 = 120$ second.

$V = 220$ volt.

$\because I = \frac{V}{R} = \frac{220}{2200} = 0.1$ ampere.

$\because I = \frac{q}{t}$

$\therefore q = I \times t = 0.1 \times 120 = 12$ coulomb.

7. Electric current (I) $= \frac{\text{quantity of charge (q)}}{\text{Time (t)}}$

$= \frac{360}{60 \times 60} = 0.1$ amp.

$\because$ Electric potential difference (V)

= Electric current (I) × Resistance (R)

$\therefore V = 0.1 \times 2200 = 220$ Volt.

8. $R = \frac{V_1}{I_1} = \frac{6}{0.5} = 12$ ohm.

$\therefore I_2 = \frac{V_2}{R} = \frac{12}{12} = 1$ amp.

9. Work (W)

= Potential diff. (V) × Quantity of electricity (q)

$= 50 \times 20 = 1000$ joule.

10. Potential difference (V) $= I \times R = 2 \times 100$

$= 200$ volt.

Work (W) $= V \times q$

$= 200 \times 10$

$= 2000$ joule.

11. $V = \frac{W}{q} = \frac{66000}{300} = 220$ volt

12. $q = \frac{W}{V} = \frac{150}{3} = 50$ coulomb.

$I = \frac{q}{t} = \frac{50}{10} = 5$ ampere.

13. (a) $I = \frac{q}{t} = \frac{300}{5 \times 60} = 1$ amp.

(b) $V = \frac{W}{q} = \frac{60}{300} = 0.2$ volt.

14. (a) $I = \frac{q}{t} = \frac{20}{5} = 4$ amp.

(b) $V = \frac{W}{q} = \frac{160}{20} = 8$ volt.

$\because R = \frac{V}{I}$

$\therefore R = \frac{8}{4} = 2$ ohm.

15. $V = I \times R = 10 \times 22 = 220$ volt.

16. $I = \frac{q}{t} = \frac{30}{1 \times 60} = 0.5$ amp.

$\because V = R \times I$

$\therefore V = 22 \times 0.5$

$= 11$ volt.

17. $R = \frac{V}{I} = \frac{220}{0.2} = 1100$ ohm.

18. $I = \frac{V}{R} = \frac{220}{1000} = 0.22$ amp.

$q = I \times t = 0.22 \times 30 \times 60 = 396$ coulomb.

15 1. ***Answer by yourself.***

2. a. The constant (fixed) resistance :

Its symbol in the electric circuit is —ᴧᴧᴧᴧ—

b. The variable resistance (Rheostat) :

Its symbol in the electric circuit is

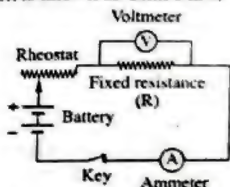
3. (a) Potential difference – Voltmeter.

(b) Resistance – Ohmmeter.

(c) Electric current intensity – Ammeter.

4. He discovered the quantitative properties of the electric current, also he discovered a law in electricity that shows the relation between the electric current and the potential difference which is known as Ohm's law.

5.



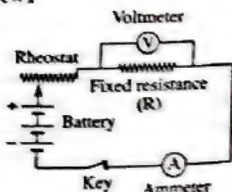
The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.

i.e. $V \propto I$ $\therefore V = \text{Constant} \times I$

The constant value is given by the symbol (R) and it is equal to the resistance of the conductor.

$\therefore V = R \times I$

6. (a)



(b) $\because$ • The reading of the ammeter (I) = 6 ampere.

• The e.m.f = 2 volt.

$\therefore$ The value of the fixed resistance

$= \frac{\text{e.m.f}}{I} = \frac{2}{6} = \frac{1}{3}$ ohm.

7. The electric resistance equals 1 ohm.

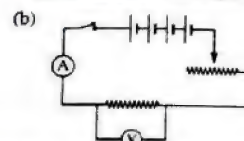
16 1. (a) (1) Open key. (2) Fixed resistance.

(3) Battery. (4) Ammeter.

(5) Voltmeter.

(6) Variable resistance (rheostat).

(b)



2. Because the connection of cells of the battery in circuit (1) is wrong, and in circuit (2) the key is open.

3. 8 volt.

4. (a) 1.5 ohms. (b) 240 coulomb.

5. (a) 3 [sliding rheostat]. (b) 1 [The voltmeter].

6. (a) ① Voltmeter. ② Ammeter.

③ Rheostat

(b) $R = \frac{V}{I}$

7. (a) By using the variable resistance (rheostat).

(b) Ammeter is connected in series, while voltmeter in parallel.

(c) $R = \frac{V}{I} = \frac{4}{0.2} = 20$ ohm.

8. (a) The resistance (R) $= \frac{V}{I}$

$= \frac{8}{2} = 4$ ohm.

(b) The quantity of electricity (q) $= I \times t$

$= 2 \times 60$

$= 120$ coulomb.

9. The quantity of electricity $= \frac{W}{V}$

$= \frac{540}{60} = 9$ coulomb.

The current intensity $= \frac{q}{t} = \frac{9}{3} = 3$ ampere.

10. • The constant resistance (R) $= \frac{\text{Potential difference (V)}}{\text{current intensity (I)}}$

$= \frac{210}{10} = 21$ ohm.

• The electric current intensity passing through a conductor is directly proportional with the potential difference between its ends when the temperature is constant.

11. (a) $V = R \times I = 5 \times 1 = 5$ volt.

(b) $V = 6$ volt.

12. (a) $I = \frac{V}{R} = \frac{6}{1.5} = 4$ amp.

(b) a. $I = \frac{V}{R} = \frac{6}{3} = 2$ amp.

The reading of the ammeter decreases in this case, because at constant potential difference, the electric current intensity is inversely proportional to the resistance.

b. $I = \frac{V}{R} = \frac{6}{0.5} = 12$ amp.

The reading of the ammeter increases in this case, because at constant potential difference, the electric current intensity is inversely proportional to the resistance.

13. (a) $I = \frac{V}{R} = \frac{5}{10} = 0.5$ ampere, the filament melt because (I) is grater than 0.1 ampere.

(b) Rheostate. – It is used to control (I) and (V) in the electric circuit.

14. (a) $I = \frac{q}{t} = \frac{30}{60} = 0.5$ amp.

(b) $R = \frac{V}{I} = \frac{2}{0.5} = 4$ ohm.

15. (a) The potential difference across a conductor.

(b) The electromotive force of the battery.

16. (a) $V_1 = 6$ volt.

(b) $V_2 = R \times I$

$= 5 \times 1$

$= 5$ volt.

17. (a) Variable resistance (Sliding rheostat).

(b) ① Copper bar. ② Slider.

③ Metallic wire coil.

④ Porcelain cylinder.

(c) ***Look at the main book on page (103).***

(d) If we make the length of wire constant.

18. (a) Rheostat - It is used to control the current intensity and the potential difference in the different parts of the circuit.

(b) ***Look at the main book on page (103).***

(c)

19. The reading of voltmeter in circuit (1) is less than that in circuit (2), due to the increasing of the length of the wire of rheostat which leads to decrease the current intensity and the potential difference.

20. The illumination of the lamp increases, because the resistance decreases, so the current intensity increases.

21. (a) Both reading will be decreases.
(b) will be increases.

22. (a) $R = \frac{V}{I} = \frac{40}{8} = \frac{50}{10} = 5$ ohm.
(b) $I = \frac{V}{R} = \frac{25}{5} = 5$ ampere.

23. (a) Electric current intensity
(b) Potential difference. (c) Resistance.
(d) Quantity of electricity.
(e) Potential difference.
(f) Work (w).
(g) Resistance (R).

Thinking Skills Questions

1 1. a 2. b 3. a 4. a 5. a 6. a

2 Q. Because the resistance of wire Q is less than the resistance of wire P, and resistance depends on the length of the its wire.

3 (a) At point (A). (b) At point (D).
(c) At point (D). (d) At point (A).
(e) At point (D).

4 (a) Conductor (A).
(b) Because "C" and "B" have the same electric potential.

Lesson 2

1 1. a 2. a 3. c 4. c 5. c 6. c
7. b 8. d 9. c 10. d 11. b 12. b
13. a 14. b 15. c 16. a 17. b 18. b
19. d 20. c 21. b 22. (1) b (2) a 23. d

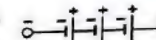
2 1. (✓)
2. (✗) ..... a direct current.
3. (✗) ....., the chemical energy is changed .....
4. (✗) ....., chemical energy .....
5. (✗) ..... and has constant intensity.
6. (✗) ....., electrons flow ..... 7. (✓)
8. (✗) ..... is variable in both intensity and direction.
9. (✗) ..... into electric energy.
10. (✗) ....., the mechanical energy converts into .....
11. (✗) ..... an alternating current.
12. (✗) The alternating current can be .....
13. (✓)
14. (✗) ...... in parallel is ......
15. (✓) 16. (✓)
17. (✗) ....., is equal to .....
18. (✗) ..... is larger than .....

3 1. The dry cell or (the battery).
2. The dynamo.
3. The direct electric current.
4. The alternating current.
5. The direct current.
6. The alternating current.
7. Series connection.
8. Series connection.

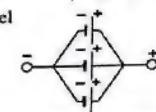
4 1. electrochemical cells – electric generators (dynamoes).
2. Dry cells – batteries 3. chemical
4. dry 5. chemical – electric
6. direct current – alternating current.
7. the flowing of electrons in one direction.
8. the kinetic – electric 9. direct
10. chemical – electric 11. direct – alternating
12. Direct – alternating 13. direct – alternating
14. Alternating – direct
15. series connection – parallel connection
16. positive – second 17. parallel – negative
18. $n \times E_1$ 19. E_1 20. series – parallel
21. (a) • parallel. • series. (b) (B)

5 1. Because they convert chemical energy into electric energy.
2. Because they produce direct electric current which is used in :-
– Electroplating process.
– Operating of some electric appliances.
3. Because it is variable in both intensity and direction.
4. Because, it can be transferred for long distances and it can be changed into a direct current.
5. Because it is variable in both intensity and direction.
6. Because it is an alternating current which is variable in direction and intensity.
7. To obtain high electromotive force.
8. To obtain low electromotive force.
9. Because the e.m.f. in case of series connection is the sum of the e.m.f. of all cells, while the e.m.f. in case of parallel connection is equal to the e.m.f. of one cell.

6 1. They are the cells in which the chemical energy is converted into electric energy.
2. It is the electric current of constant intensity and direction.
3. It is the electric current of variable intensity and direction.
4. • In series



• In parallel



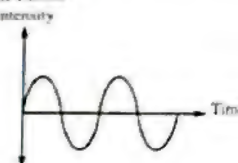
7 1. ***Look at the main book on pages*** **(133 & 134).**
2. • Electric cells convert chemical energy into electric energy.
• Dynamoes convert mechanical energy into electric energy.
3. ***Look at the main book on page*** **(138).**
4. ***Look at the main book on page*** **(140).**

8 1. Generating direct electric current.
2. Generating alternating electric current.
3. It is used in electroplating processes and in operating of some electric appliances.
4. It is used in lighting houses and in operating electric appliances.

9 1. The chemical energy changes into electric energy.
2. The mechanical (kinetic) energy changes into electric energy.

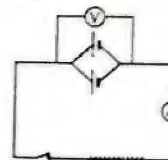
10 1. The electromotive force of the battery increases.
2. The electromotive force of the battery equals the e.m.f. of one cell.

11 1. The current intensity

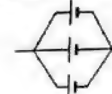


2. The current intensity

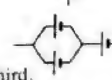
3.



12 1. (a) All the cells are connected in parallel.



(b) Two cells are connected in parallel and the both are connected in series with the third.



(c) All the cells are connected in series.

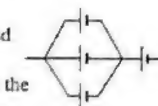
2. (a) $E_{battery}$ (e.m.f.) $= E_1 + E_2 + E_3$
$= 1.5 + 1.5 + 1.5 = 4.5$ volt.
(b) $E_{battery}$ (e.m.f.) $= E_1 = 1.5$ volt.

3. (a) All the cells are connected in series.

(b) Two cells are connected in parallel and the both are connected in series with the third and the fourth.

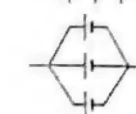
(c) • **The first way :**
Two cells are connected in parallel and the other twice also are connected in parallel then the two groups are connected in series.

• **The second way :**
Three cells are connected in parallel and they are connected in series with the fourth.

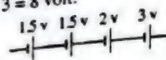


(d) All the cells are connected in parallel.

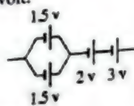
4. • To get highest e.m.f.
The $E_{total} = n \times E_1$
• To get the lowest e.m.f.
The $E_{total} = E_1$



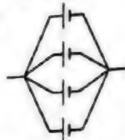
5. (a) e.m.f. = 2 × 1.5 + 2 + 3 = 8 volt.



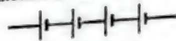
(b) e.m.f. = 1.5 + 2 + 3 = 6.5 volt.



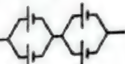
6. (a) All the cells are connected in parallel.



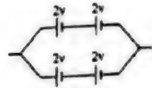
(b) All the cells are connected in series.



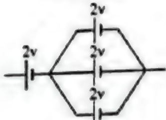
(c) Two cells are connected in parallel and the other twice also are connected in parallel, then the two groups are connected in series.



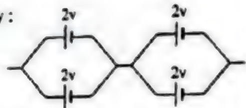
7. The first way :



The second way :



The third way :

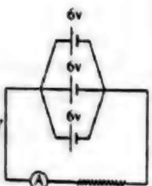


8. (a)

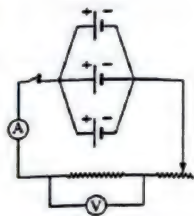
(b)

(c)

9. ∵ I = 1.5 amp.
R = 4 ohm.
V = I × R = 4 × 1.5 = 6 V
So, the circuit will be as the opposite figure.



13 1. a.



b. By using the sliding rheostat.
c. Parallel connection.
d. 2 volt.

2. a. Series connection.
b. e.m.f = 1.5 + 1.5 + 1.5 = 4.5 volt.

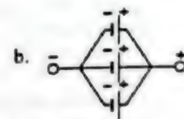
3. e.m.f = 1.5 + 1.5 + 1.5 = 4.5 volt.

4. e.m.f = 3 + 1.5 = 4.5 volt.

5. • e.m.f in circuit (1) = 2 + 2 = 4 volt.
• e.m.f in circuit (2) = 2 + 2 + 2 = 6 volt.

6. a.

b.



7. $I = \frac{q}{t}$
∴ q = I × t = 2 × (5 × 60) = 600 coulomb.
∵ $V = \frac{W}{q}$
∴ W = V × q = 6 × 600 = 3600 joule.

8. a. The e.m.f of the battery = 2 + 2 + 2 = 6 volt.
b. The reading of the ammeter = $\frac{V}{R}$ = $\frac{6}{2}$ = 3 ampere.

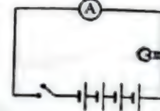
9. The total e.m.f of the battery = 3 + 3 = 6 volt
$I = \frac{V}{R} = \frac{6}{4} = 1.5$ ampere

10. a. V_1 = 3 volt.
b. V = R × I
= 4 × 2 = 8 volt. (The total e.m.f.)
$V_2 = V - V_1 = 8 - 3 = 5$ volt.

11. a. $I = \frac{q}{t} = \frac{20}{40} = 0.5$ ampere.
b. V = 2 volt.
c. $R = \frac{V}{I} = \frac{2}{0.5} = 4$ ohm.

12. a. e.m.f. = 2 × 3 = 6 volt.
b. $I = \frac{V}{R}$ $I = \frac{6}{3} = 2$ amp.
c. Rheostat and voltmeter.

13. a. V = R × I
= 60 × 0.1 = 6 volt
The least number of cells = $\frac{6}{1.5}$ = 4 cells
b.



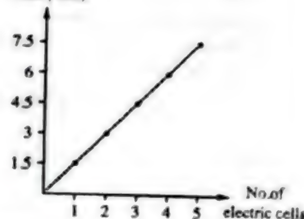
14. V = R × I
= 3 × 2 = 6 volt
E = 6 − 2 = 4 volt

15. Fig. (1) : a. direct current.
b. dry cells.
Fig. (2) : a. parallel.
b. the e.m.f. of one cell.

16. Fig. (1) : a. parallel. b. 2
c. $I = \frac{V}{R} = \frac{2}{4} = 0.5$ amp.
Fig. (2) : a. series. b. 4
c. $I = \frac{V}{R} = \frac{4}{4} = 1$ amp.

17. Graph (A) represents parallel connection.
Graph (C) represents series connection.

18. a.



b. The electromotive force of one cell = 1.5 volt.
c. The type of connection is series connection.

19. a. direct - electrochemical cells - chemical
b. alternating - electric generators - kinetic

20. a. Fig. (1) : Alternating current.
Fig. (2) : Direct current.
b. Fig. (1) : It is produced from electric generators (as Dynamoes).
Fig. (2) : It is produced from electrochemical cells such as batteries and dry cells.
c. Fig. (1) : It is used in lighting houses and in operating electric appliances.
Fig. (2) : It is used in electroplating processes and in some electric appliances.
d. Fig. (1)

21. a. The ammeter reading (I) = $\frac{q}{t} = \frac{20}{40}$ = 0.5 ampere.
b. e.m.f. = 1.5 volt.
c. The resistance of the wire (R) = $\frac{V}{I} = \frac{1.5}{0.5}$ = 3 ohm.

22. a. The e.m.f. of the battery = 1.5 + 1.5 + 1.5 + 1.5 = 6 volt.
b. ∵ V = I × R
∴ The reading of the ammeter (I) = $\frac{V}{R} = \frac{6}{3}$ = 2 amp.

23. Fig. (1) : $I = \frac{V}{R} = \frac{4}{10} = 0.4$ amp.
Fig. (2) : $I = \frac{V}{R} = \frac{2}{10} = 0.2$ amp.

24. The reading of the voltmeter = 1.5 + 2 + 2 + 3 = 8.5 volts.

25. a. 6
b. 8

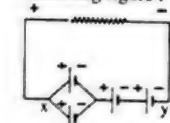
26. a. Fig. (1) : Series connection.
Fig. (2) : Parallel connection.
b. Fig. (1) : 6 volt.
Fig. (2) : 1.5 volt.
c. In the series way which is represented by fig. (1).

27. Fig. (1) : e.m.f. = 4 × 1.5 = 6 volt.
Fig. (2) : e.m.f. = 1.5 + 1.5 + 1.5 = 4.5 volt.
Fig. (3) : e.m.f. = 1.5 + 1.5 = 3 volt.

28. a. e.m.f. = 2 + 2 + 2 = 6 volt.
b.

29. The battery (2) gives higher voltmeter reading (e.m.f.) as the cells are connected in series so, the e.m.f. = $E_1 + E_2 + E_3$ but in battery (1) e.m.f. = E_1 as the cells are connected in parallel.

30. ∵ I = 3 ampere. R = 3 ohm.
∴ V = I × R = 3 × 3 = 9 volt.
So, the method of connection will be as the following figure :



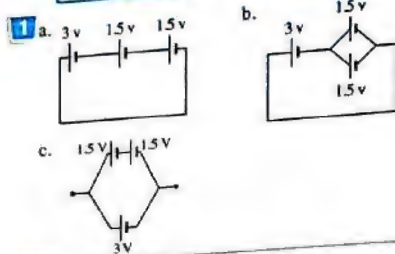
$I = \frac{q}{t}$, q = I × t = 3 × $\frac{1}{2}$ × 60 = 90 coulomb.

31. a. I = Zero

b. $I = \frac{V}{R} = \frac{4+2}{2} = \frac{6}{2} = 3$ ampere.

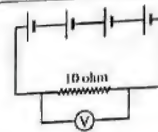
Thinking Skills Questions

1 a. b. c.

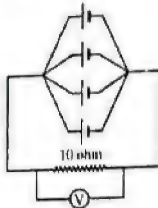


2 7 electric cells (2 connected in parallel + 5 connected in series).

3 a. Circuit (X)



Circuit (Y)



b. • circuit (X)

$I = \frac{V}{R} = \frac{6}{10} = 0.6$ ampere.

• Circuit (Y)

$I = \frac{V}{R} = \frac{1.5}{10} = 0.15$ ampere.

4 a. (✗) b. (✗)

5 (b)

6 Circuit (1) :

(1) 3 volt (2) 1.5 volt

(3) 1.5 volt (4) 4.5 volt

Circuit (2) :

(1) 1.5 volt (2) 1.5 volt

(3) 1.5 volt (4) 4.5 volt

Lesson 3

1 1. a 2. b 3. b 4. c 5. d 6. a
7. a 8. d 9. b 10. d 11. d 12. b
13. c 14. c 15. a 16. b 17. c 18. a
19. c 20. a 21. b 22. d 23. b

2 1. (✗) The atom's nucleus ....
2. (✗) Nucleus is ....
3. & 4. (✗) .... Henri Becquerel.
5. (✗) The radioactivity ....
6. (✓) 7. (✓) 8. (✓)
9. (✗) .... unstable (radioactive) elements ....
10. (✗) .... can be ....
11. (✓)
12. (✗) .... the industrial field ....
13. (✗) .... by radioactive isotopes elements.
14. (✗) .... of neutrons. 15. (✓)
16. (✓) 17. (✓) 18. (✓)
19. (✗) .... 20 ....
20. (✗) .... to a small .... for a long time ....
21. (✗) The bone marrow ....
22. (✗) .... is the Sievert.

3 1. Nuclear energy.
2. Nuclear binding force.
3. Radioactive elements.
4. Radioactivity phenomenon.
5. Artificial radioactivity.
6. Radiation pollution.
7. Cosmic radiation (Natural radiation).
8. Isotopes.
9. Physical effects of radiation pollution.
10. Cellular effects. 11. The Sievert.

4 1. atoms – nucleus. 2. physical – chemical
3. mass – nuclear energy
4. nuclear binding – nucleus.
5. Henri Becquerel. 6. uranium – solid
7. neutrons.
8. radioactive – radioactivity
9. Radium – uranium 10. natural – artificial
11. peaceful – military 12. Nuclear
13. medical field – agricultural field
14. treatment – diagnoses
15. eliminate pests – some plants races.
16. silicon – electric 17. turbines – electricity.
18. fuel – rockets 19. petroleum – water.
20. radiation – environment.

21. Earth's surface – cosmic
22. iodine – cesium 23. protons – neutrons.
24. bone marrow – spleen – digestive system.
25. physical – cellular 26. genetic
27. cells composition – the hemoglobin.
28. physical – genetic 29. the Sievert.
30. 1 milli Sievert 31. gloves – clothes
32. underground water – earthquakes and volcanoes.
33. a steady – earthquakes – volcanoes.
34. cement – rocks

5 1. Due to the presence of nuclear binding forces that is originated inside the nucleus, which binds the nucleus components together and overcomes the repulsion force between the positively charged protons.
2. Due to the presence of nuclear binding forces which overcomes the repulsion force between the positively charged protons.
3. Due to their excess energy as a result of their atoms' nuclei containing neutrons more than required for their stabilization.
4. Because they spontaneous release unseen rays as a result of their atoms' nuclei containing neutrons more than required for their stabilization.
5. Because the nucleus of its atom contains a number of neutrons more than the number required for its stability which causes the presence of excess energy emitted in a form of invisible (unseen) radiation.
6. Because there are natural radioactivity which is produced from the radioactive elements present in nature and cosmic radiation that comes from outer space, and artificial radioactivity which is produced from nuclear reactions and nuclear bombs.
7. Due to the increase of the amount of radiation in the environment.
8. Because they produce nuclear radiation in the environment.
9. Due to an error in operation.
10. Due to the transference of the polluted atomic cloud by the wind, then rain fall and radioactive isotopes transferred to the soil and polluted plants, then animals and their milk and meat were polluted.

11. Due to the damage of bone marrow which is responsible for the formation of red blood cells.
12. Because radiation causes changes in the sex chromosomes composition.
13. Because radiation causes changes in the cells composition which lead to destroy the cells.
14. To protect themselves from radiation pollution.
15. To prevent water pollution.
16. To prevent the spread of radiation to other areas.

6 1. The energy stored in the nucleus and it is liberated during nuclear reactions.
2. It is the energy which is necessary to bind the nucleus components together and overcome the repulsion forces that are present between the positively charged protons and each others.
3. They are elements whose nuclei contain a number of neutrons more than the number required for its stability.
4. It is the spontaneous decaying of the atoms' nuclei of some radioactive elements that are present in the nature in an attempt to achieve a more stable composition.
5. It is the radiation or nuclear energy that is released either from nuclear reactions or nuclear bombs.
6. It is the increase of the amount of radiation in the environment.
7. They are atoms of the same element with different number of neutrons and with the same number of protons.
8. It is the international measuring unit of absorbed nuclear radiation by the human body.

7 1. It binds the nucleus components together and overcomes the repulsion force between the positively charged protons.
2. They are used to treat and diagnose diseases like cancer.
3. a. It is used to operate rockets that fly in the space.
b. It is used for drilling of petroleum and underground water.
c. It is used to eliminate pests and to improve some plants races.
d. It is used to treat and diagnose diseases like cancer.

4. The nuclear energy is used to heat water to produce steam. This steam is used to operate turbines to generate electricity.
5. Converting sand to silicon sheets used in manufacturing of computer processors and programmed electric circuits that are used in electric appliances also used to discover defects in the manufactured products.

3

1.

Natural radioactivity	Artificial radioactivity
It is the spontaneous decaying of the atoms nuclei of some radioactive elements that are present in nature in an attempt to achieve a more stable composition.	It is the radiation or nuclear energy that is either released during nuclear reactions or nuclear bombs.

2.

Nuclear reactors	Nuclear bombs
- They can be controlled. - They are used in peaceful uses.	- They can't be controlled. - They are used in military uses.

3. *Look at the main book on page* (168).
4. *Look at the main book on page* (171).

4 1. a. Its energy increases, so it emits unseen (invisible) radiations to reach a more stable composition.
b. This will lead to the damage of :
- Bone marrow. • Spleen.
- Digestive system.
- Central nervous system.

c. Changes in the cells composition which lead to destroy the cells.
d. It becomes incapable of carrying oxygen.

2. a. When the number of neutrons increases more than the number required for its stability.
b. – The radiation [artificial / industrial radioactivity] which can be controlled is used in peaceful uses.
– The radiation [artificial / industrial radioactivity] which cannot be controlled is used in military uses.

3. Radioactivity was discovered by the scientist Henri Becquerel in 1896. He discovered the emission of an unseen rays from the uranium element, this ray penetrate solid objects.
4. – Natural radioactivity.
– Artificial radioactivity
5. a. *Look at the main book on pages* (164 & 165).
b. *Look at the main book on page* (168).
6. The nuclear energy is used to heat water to produce steam. This steam is used to operate turbines to generate electricity (electric energy).
7. *Look at the main book on pages* (167 & 168).
8. Dr. Ali Mostafa Mosharafa.
9. – **Natural sources.**
Their examples :
- Radioactive elements found on the Earth's surface.
- Cosmic radiation comes from outer space.

– **Artificial sources.**
Their examples :
- Nuclear bombs.
- Nuclear reactors.

10. Physical, genetic and cellular effects.
11. *Look at the main book on page* (171).
12 , 13 & 14. *Look at the main book on page* (172).

Thinking Skills Questions

1 1. loses electrons.
2. gains electrons.
3. Emits radiations.

2 (1/b) . (2/a) . (3/d) . (4/c)

3 a. B (beta) as it attracted to the positive pole.
b. α (alpha) rays.

4 Because the mass number = number of protons + number of neutrons
so, it equals 92 + 146 = 238

Project on UNIT Two *Answer by Yourself*

Unit Three

The Lesson

1 1. c 2. b 3. b 4. d 5. a 6. b
7. a 8. a 9. c 10. d 11. b 12. c
13. b 14. c 15. b 16. b 17. c 18. c
19. d 20. d 21. c 22. c 23. c 24. c
25. a 26. c 27. c 28. a 29. d 30. c
31. c 32. c 33. d 34. b 35. a 36. b
37. a 38. d 39. d 40. d 41. c 42. c
43. (A) a - (B) b - (C) b
44. c 45. a 46. b 47. a 48. b 49. a
50. b 51. a 52. c 53. b 54. b 55. a

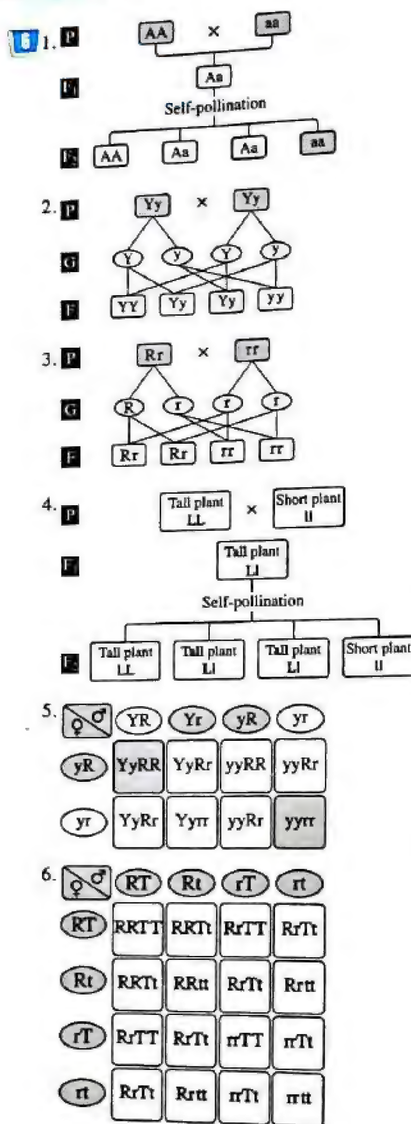
2 1. acquired traits. 2. Mendel 3. pea
4. seven 5. sinuous 6. stamens
7. segregation of factors.
8. independent assortment of hereditary factors.
9. one parent is impure dominant and the trait of the other is recessive.
10. hybrid yellow 11. genes 12. hybrid
13. pure
14. 3 dominant : 1 recessive 15. 25 %
16. recessive 17. enzyme
18. in the nucleus of the cell.
19. Watson and Crick
20. Badel and Tatum

3 1. (✗) The hereditary traits ..... 2. (✓)
3. (✗) The red flowers and the white .....
4. (✗) The dominant trait .....
5. (✗) ..... by one pair of ..... 6. (✓)
7. (✗) ..... produces hybrid tall stem plants at a ratio of 50% and short stem plants at a ratio of 50%
8. (✗) ..... at a ratio of 3 dominant : 1 recessive
9. (✗) ..... 3 dominant : 1 recessive
10. (✓) 11. (✓) 12. (✓)
13. (✗) ..... in the pure individual.
14. (✓) 15. (✗) Wide eye is one .....
16. (✓) 17. (✓) 18. (✓)
19. (✓) 20. (✗) ..... a dominant trait.
21. (✗) ..... in the nucleus .....
22. (✓)
23. (✗) ..... a complete group of genes .....
24. (✗) ..... with protein.

4 1. Hereditary traits. 2. Acquired traits.
3. Genetics. 4. Mendel.
5. Pea plant.
6. The principle of complete dominance.
7. Gametes.
8. Law of segregation of factors (Mendel's first law).
9. Dominant trait. 10. Recessive trait.
11. Pure individual. 12. Hybrid individual.
13. Recessive gene.
14. Law of independent assortment of hereditary factors (Mendel's second law).
15. Genes. 16. Chromosome.
17. A model of Watson and Crick for composition of DNA molecule.
18. Enzyme. 19. Watson and Crick
20. Vitamin A 21. Human genome.
22. Carotene.

5 1. genetics 2. hereditary – acquired
3. Hereditary 4. Acquired
5. acquired – hereditary
6. Mendel – pea – hermaphrodite
7. seven
8. artificially pollinated – short.
9. self – cross
10. dominant – recessive 11. yellow – red.
12. side – end. 13. seeds – fruits
14. gametes.
15. hereditary factors – genes.
16. hybrid 17. dominant – recessive.
18. hybrid individual. 19. Johansen – gene
20. pure 21. hybrid yellow – green
22. two – one
23. segregation of factors – independent assortment of hereditary factors.
24. 3 (dominant trait) : 1 (recessive trait)
25. 3 (dominant trait) : 1 (recessive trait).
26. 3 : 1 – 3 : 1
27. the principle of complete dominance.
28. dominant – recessive 29. dominant – recessive
30. the coloured eyes trait. 31. DNA – protein.
32. Watson – Crick 33. Genes
34. Badel – Tatum 35. gene – nucleotides.
36. enzyme – protein 37. (A) – losing the sight.
38. carotene – (A). 39. human genome – 99
40. The human genome

6



7. (1) Chemical reaction (2) Protein
(3) Specific hereditary trait

7

1. & 2. Because it's acquired trait that can't be transmitted from a generation to another.

3. Because the scientific studies of heredity started with Mendel's experiments on pea plant and according to the results reached by Mendel, scientists of heredity have gathered a lot of information about how the hereditary traits are transmitted from one generation to another.
4. *Look at the main book on page* (188).
5. To insure that the plant doesn't be self-pollinated.
6. To prevent cross-pollination with other flowers.
7. To be sure of the purity of the trait.
8. Due to the separation of the two genetic factors from each other during the formation of gametes.
9. Because the green colour trait of seeds is a recessive trait that disappears in all individuals of the first generation, in which the dominant trait appears at a ratio of 100% according to Mendel's first law.
10. Because the trait of green pods dominates over the trait of yellow pods according to the principle of complete dominance.
11. Because the trait of tall stem dominates over the trait of short stem according to the principle of complete dominance.
12. Because the plant with yellow seeds is impure (hybrid).
13. Because the dominant trait is hybrid.
14. Because it doesn't appear unless the two genes of recessive trait aggregate.
15. Because there are recessive traits that do not appear in parents but they appear in the offspring when the two genes of them aggregate together.
16. Because the gene of curly hair dominates over the gene of smooth hair when they aggregate together.
17. Because the gene of curly hair is a dominant gene, so its trait appears if it exists with another similar dominant gene (curly hair) or with a recessive gene (straight hair).
18. Because the gene of the ability to roll the tongue dominates over the gene of the non-ability to roll the tongue if they are both present in an individual.
19. Because the gene of the free ear lobe dominates over the gene of the attached ear lobe if they are both present together in an individual.
20. Because the gene of the wide eyes dominates over the gene of the narrow eyes if they are both present together in an individual.

21. Because both parents are hybrid, so the dominant trait (free ear lobe) appears on them, but when the two factors of recessive trait (attached ear lobe) aggregate from each of them, this trait appears in offspring.
22. Because DNA consists of the genes which are responsible for appearance of the hereditary traits in living organisms.
23. Because every gene gives a special enzyme which is responsible for the occurrence of a chemical reaction resulting in a protein showing a specific hereditary trait.
24. As a result of malnutrition which is produced from deficiency in vitamin (A).
25. Because the normal rice doesn't contain carotene substance which changes inside the body into vitamin (A), which its deficiency in the body leads to losing the sight.
26. Because rice doesn't contain pro-vitamin (A) which is known as carotene which is converted into vitamin (A) inside the body.

8

1. It is a science that researches the transmission of the hereditary traits from one generation to another by studying the similarities and differences between the parents and the offspring.
2. They are the traits that are transmitted from one generation to another.
3. They are the traits that aren't transmitted from one generation to another.
4. – It is the appearance of a dominant hereditary trait in all individuals of the first generation when two individuals are crossed and one of them carries a pure trait contrasting the trait carried by the other individual.

   Example :

   – Smooth seed trait of pea plant dominates over wrinkled seed trait.
5. When two pure individuals of any one pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).
6. The cells by which the hereditary traits are transmitted from parents to offspring.
7. It is the trait that appears in all individuals of the first generation.
8. It is the trait that disappears completely in the individuals of the first generation.
9. It is the individual that carries a different pair of genes, one is dominant and the other is recessive, so the dominant trait (impure) appears on the individual.
10. It is the individual that carries a similar pair of genes either dominant or recessive, so the dominant trait (pure) or recessive trait appears on the individual.
11. When two pure different individuals bearing two pairs or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).
12. It is a structure inside the cell nucleus that represents the genetic material of the living organism and is chemically consists of nucleic acid DNA binds with protein.
13. It is a part of DNA present on the chromosomes and controls the individual's hereditary traits.
14. It is a genetic map that shows the complete set of genes present on the human chromosomes.

9

1. They control the appearance of hereditary traits of the living organism.
2. *Look at the main book on page* (209).
3. Solving the problem of malnutrition caused by deficiency of vitamin (A).

10

1. Cross-pollination occurs in these flowers.
2. Self-pollination occurs in these flowers.
3. They produce a generation carries the hybrid dominant trait only.
4. All individuals of the first generation appear carrying the dominant trait only and in the second generation the dominant trait and the recessive trait appear at a ratio of 3 : 1 respectively.
5. The dominant trait appears.
6. The result of the produced generation is 50% hybrid dominant trait (tall stem) : 50% pure recessive trait (short stem).
7. They produce a generation of yellow seeds and green seeds at a ratio of 3 : 1 respectively.
8. They produce pea plants all of them are hybrid green pods.
9. The dominant gene prevents the appearance of the effect of the other gene, and so the dominant trait appears.

10. They produce pea plants at a ratio of 9 (tall stem & red flowers) : 3 (tall stem & white flowers) : 3 (short stem & red flowers) : 1 (short stem & white flowers).

11. They produce individuals carry the ability to roll the tongue trait.

12. The chemical reaction which results in a protein showing a specific hereditary trait will not occur, and so the genetic traits doesn't appear.

13. Deficiency in vitamin (A) inside the body which may lead to loss of sight.

11 1.

The hereditary traits	The acquired traits
They are the traits that are transmitted from one generation to another. Ex. : Hair colour, skin colour, ...	They are the traits that aren't transmitted from one generation to another. Ex. : The skills of playing football, learning of swimming, ...

2. *Look at the main book on page* **(195).**

3. *Look at the main book on page* **(195).**

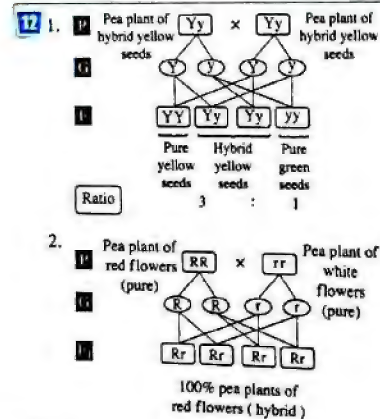
4. *Look at the main book on page* **(194).**

5. • **The wide eyes :** Dominant trait.
   • **The narrow eyes :** Recessive trait.

6. • **The black eyes :** Dominant trait.
   • **The narrow eyes :** Recessive trait.

7. • **Ordinary rice :** It doesn't contain pro-vitamin (A).
   • **Genetically modified rice :** It contains pro-vitamin (A).

12 1.



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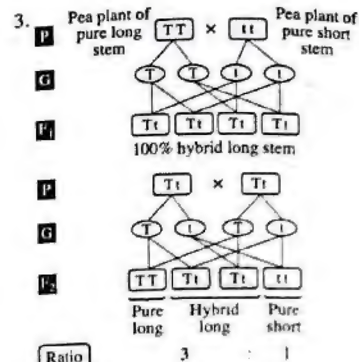

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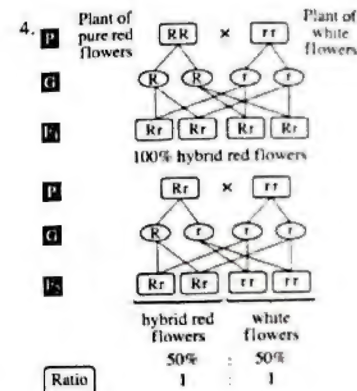

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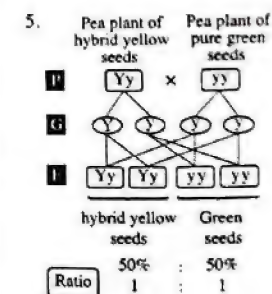

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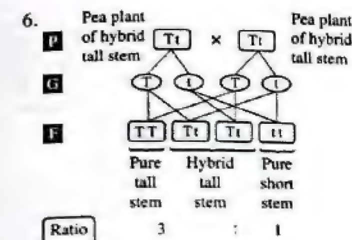

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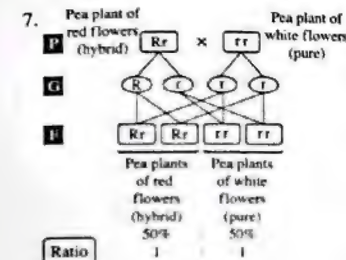

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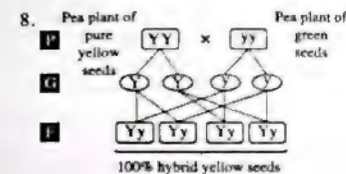
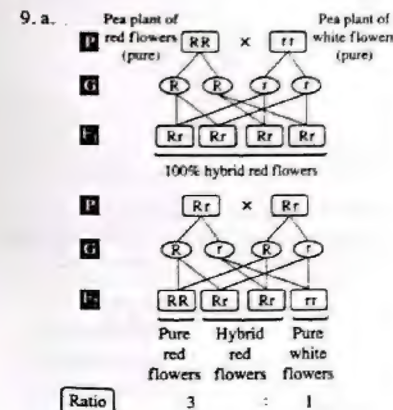
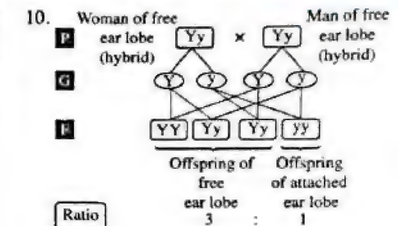


9. a.

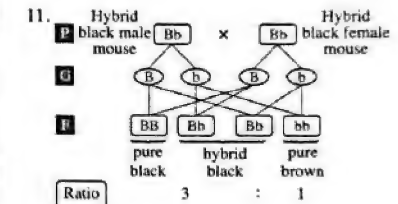


b. *Look at the main book on page (203).*

10.



11.



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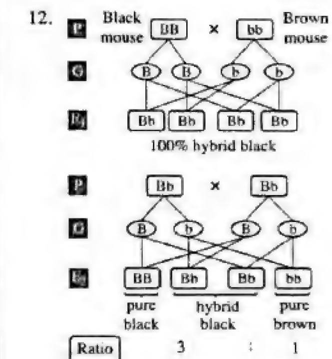

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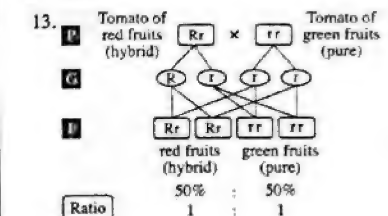

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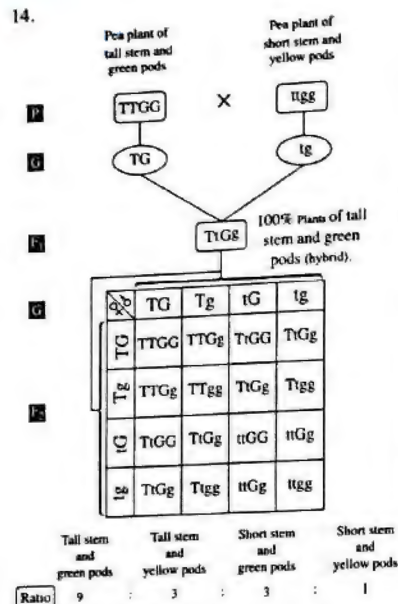

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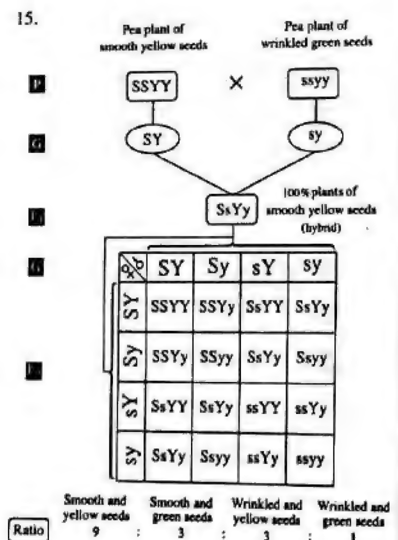

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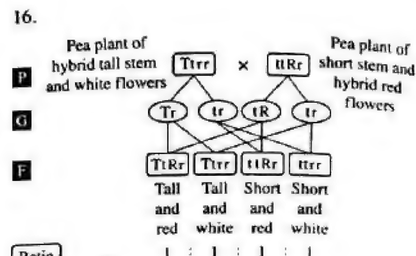

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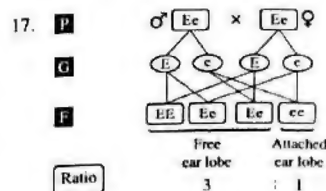

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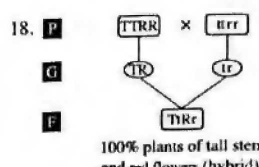
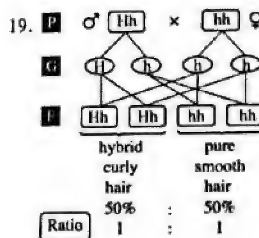
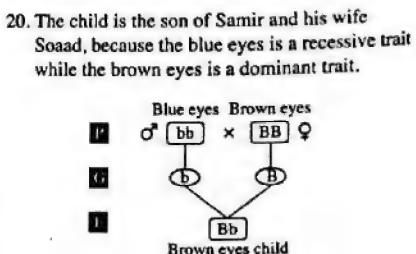


19.

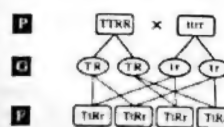


20. The child is the son of Samir and his wife Soaad, because the blue eyes is a recessive trait while the brown eyes is a dominant trait.



13

1. *Look at the main book on page* **(192).**
2. *Look at the main book on page* **(193).**
3. (a) He is the founder of heredity.
   (b) They make a model of DNA molecule.
   (c) They discovered the means of how the genes control the appearance of hereditary traits.
4. The idea of Rasha is correct, because the female cat of Rasha may be hybrid and the male cat may be hybrid, so they produce generation contains black cats and white cats with a ratio of 3 : 1 according to Mendel's first law.
5. - Plant of pure long stem & red flowers is TTRR
   - Plant of short stem & white flowers is ttrr

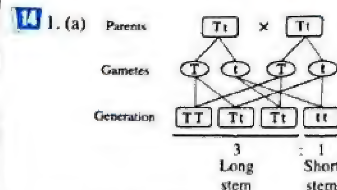


All individuals of the first generation are hybrid long stem & red flowers.

6. (a) TtRr (b) ttrr
7. *Look at the main book on pages* **(200 & 201).**
8. *Look at the main book on pages* **(189 & 190).**
9. *Answer by yourself.*
10. (a) The gene of curly hair dominates over the gene of smooth hair if they are both present in an individual.
    (b) The gene of the presence of facial dimples dominates over the gene of absence of facial dimples, if they are both present in an individual.
11. (a) Chromosome chemically consists of nucleic acid (DNA) binds with protein.
    (b) Nucleic acid (DNA) consists of smaller parts called genes, where each gene consists of smaller structural units called nucleotides.
12. (a) : Recessive trait.
    (b) & (c) : Dominant trait.
13. (a) *Look at the main book on page* **(207).**
    (b) *Look at the main book on page* **(207).**
14. Badel and Tatum.
15. Modifying the genetic composition of the rice crop by inserting the genes that result in the creation of the pro-vitamin (A) compound inside the tissue that stores starch in rice grains.
16. *Look at the main book on page* **(209).**

14

1. (a)



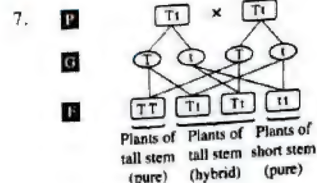
   (b) The ratio is 3 (dominant trait) : 1 (recessive trait).
2. (a) Rr (b) Rr / rr
   (c) Yes, because the dominant trait appears in individuals of first generation at a ratio of 100% and in the individuals of the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).
   (d) Because the white colour trait is a recessive trait which disappears in the individuals of first generation which carry the dominant trait at a ratio of 100% according to Mendel's first law.
3. (a) All of them are (Gg). - no one.
   (b) Green pods is a dominant trait and yellow pods is a recessive trait.
   (c) One (GG) and two (Gg).
   (d) • One pure green. • Two hybrid green.
   • One pure yellow.
4. (a) ① Tt ② t ③ Tt
   (b) Yes, because the ratio of the produced generation is

   tall stem (dominant trait) : short stem (recessive trait)
   3 : 1

5.

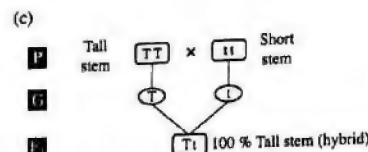
♂gametes / ♀ gametes	AR	Ar	aR	ar
AR	AARR	AARr	AaRR	AaRr
Ar	AARr	AArr	AaRr	Aarr
aR	AaRR	AaRr	aaRR	aaRr
ar	AaRr	Aarr	aaRr	aarr

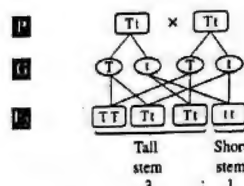
6. (a) • Dominant trait : smooth seeds.
   • Recessive trait : wrinkled seeds.
   (b) Ss
   (c) - Pea plants of smooth seeds at a ratio of 75%
   - Pea plants of wrinkled seeds at a ratio of 25%
   (d) (1) Zero (2) 25% (3) 50%

7.


8. (a) Pea plants of hybrid tall stem Tt.

(b)

(c)




9. (a) ① Ry ② RrYY ③ RrYy ④ rryy

(b) • The law of independent assortment of hereditary factors (Mendel's second law).

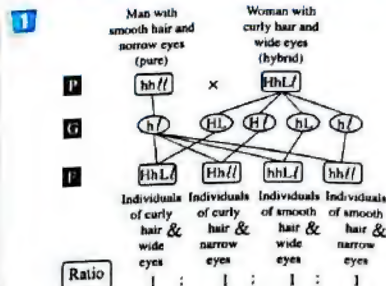
• It states that when two pure different individuals bearing two pairs or more of alternative traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait)

10. (a) ① Gene ② DNA ③ Chromosome

(b) nucleotides

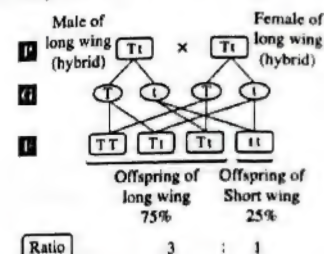
(c) DNA binds with protein.

Thinking Skills Questions

1


2 ∵ The produced ratio is 27 : 9 i.e. 3 : 1

∴ The parents are hybrid.



3 1. • Dominant trait : Absence of freckles trait.

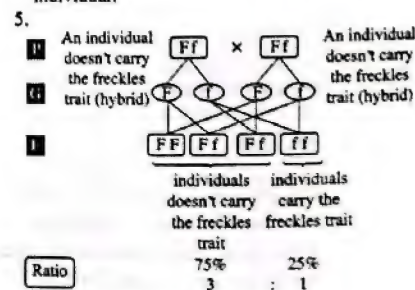
• Recessive trait : presence of freckles trait.

2. • (1) & (3) : Ff • (2) & (4) : ff

3. (a) (1) & (3) (b) (2) & (4)

(c) (2) & (4)

4. Because the gene of absence of freckles (F) dominates over the gene of presence of freckles (f), if they are both present together in an individual.

5.


6. P FFBB × ffbb

G FB fb

F FfBb

100% individuals without freckles in face and have black hair

Project On UNIT Three *Answer by Yourself*

Unit Four

The Lesson

1

1. c	2. b	3. c	4. c	5. d	6. d
7. d	8. a	9. a	10. d	11. b	12. a
13. b	14. c	15. a	16. c	17. d	18. b
19. d	20. c	21. a	22. b	23. d	24. a
25. a	26. b	27. d	28. b	29. b	

2

1. 1. e 2. h 3. f 4. g 5. b 6. c 7. a

2. 1. c 2. b 3. a 4. e 5. d

3

1. (✗) ..... ductless glands.
2. (✗) Pituitary .....
3. (✗) ..... 50 hormones ......
4. (✓)
5. (✗) Pituitary .....
6. (✗) ..... on increasing .....
7. (✗) In the childhood .....
8. (✗) Gigantism .....
9. (✓)
10. (✓)
11. (✗) ..... by pancreas.
12. (✓)
13. (✗) The iodine ....
14. (✓)
15. (✗) ..... adrenalin .....
16. (✗) Simple goiter .....
17. (✗) Testosterone ....
18. (✗) Progesterone ....

4

1. The endocrine glands.
2. Hormone.
3. The blood.
4. Target cells.
5. Hormone disorder.
6. The pituitary gland.
7. The pituitary gland.
8. Growth hormone.
9. Dwarfism.
10. Gigantism.
11. Thyroid gland.
12. Calcitonin hormone.
13. Adrenalin hormone
14. Thyroxin hormone.
15. Exophthalmic goiter.
16. Simple goiter.
17. Iodine.
18. The pancreas.
19. Insulin hormone.
20. Glucagon hormone.
21. Diabetes.
22. Adrenal gland.
23. Estrogen hormone.
24. Progesterone hormone.
25. Testosterone hormone.
26. Hormone disorder.

5

1. hormone.
2. endocrine glands.

3. nervous system
4. The blood – target
5. 50
6. Pituitary gland – thyroid gland
7. pituitary gland – main gland – master gland.
8. sexual
9. Pituitary – growth
10. growth – childhood
11. dwarfism.
12. Thyroid - thyroxin.
13. thyroxin - calcitonin
14. hormone
15. calcitonin
16. simple goiter – exophthalmic goiter.
17. thyroxin – thyroid
18. Adrenalin – two adrenal
19. Exophthalmoses – enlargement of thyroid gland
20. stomach – small intestine.
21. glucagon
22. Glucagon
23. glucose sugar
24. insulin
25. insulin – glucose
26. diabetes.
27. estrogen – testosterone
28. progesterone
29. hormone disorder.

6

1. Because the blood is the only way for hormones to reach their target cells.
2. Because the target cells that are affected by hormones are located faraway from endocrine glands, so the blood is the only way for the hormones to reach them.
3. Because it secretes hormones that regulate the activities of most of other endocrine glands.
4. Because it secretes the facilitating hormone during delivery and the mammary glands activating hormone to secrete milk during breast feeding process.
5. Due to the increase in the secretion of the growth hormone at the childhood.
6. Due to the decrease in the secretion of growth hormone at childhood.
7. Because iodine salt is rich in iodine element that enters in the thyroxin hormone's structure.
8. Because iodine enters in the structure of thyroxin hormone which plays a main role in food assimilation processes in the body.
9. Due to the decreasing or increasing in the secretion of the thyroxin hormone.
10. Due to the decrease in the secretion of the thyroxin hormone as a result of the lack of iodine from food as it enters in the hormone's structure.
11. Because it secretes calcitonin hormone which controls the level of calcium in the blood.
12. Because they secrete the adrenalin hormone that stimulates the human body organs to respond to emergencies.
13. Because the pancreas act as a ductless gland which secretes the insulin and glucagon hormones (that regulate glucose sugar level in the blood), and it also secretes digestive juices (that help in digestion process) through a duct.
14. Because the pancreas secretes the insulin hormone and the glucagon hormone and the function of each hormone contradicts the function of the other hormone.
15. Because it raises the level of glucose sugar in blood until reaches the normal level by stimulating the liver cells to convert the glycogen stored inside it into glucose sugar.
16. Because it reduces the level of glucose sugar in blood until reaches the normal level by stimulating the body's cells to use glucose from blood.
17. Because it reduces the percentage of glucose sugar in blood.

7

1. They are chemical substances (or chemical messages) that control and organize most of the vital activities and functions in the bodies of living organisms.
2. They are ductless glands that secrete their hormones directly in the blood without passing through ducts.
3. They are the cells that the hormones affect and they are almost located away from the endocrine gland that secretes the hormone.
4. It is the increase or decrease in the secretion of one of the hormones, when the endocrine gland that secrets it doesn't act properly.
5. The body stops growing, so the person becomes a dwarf as a result of decreasing the secretion of the growth hormone at the childhood.
6. A continuous growth in the limb's bones, so the person becomes a giant as a result of increasing the secretion of the growth hormone at the childhood.
7. A disease causes an enlargement of thyroid gland and the neck as a result of decreasing the secretion of thyroxin hormone.
8. A disease causes enlargement of thyroid gland accompanied by loss of weight, tension and exophthalmoses as a result of increasing the secretion of thyroxin hormone.
9. A disease caused by the decrease in the secretion of insulin hormone, which leads to increasing the level of glucose sugar in the blood and its existence with the urine.

8

1. All other endocrine glands will suffering, which leads to hormones disorders.
2. The body stops growing, so the person becomes a dwarf.
3. A continuous growth in the limbs' bones, so the person becomes a giant.
4. The human will suffer from exophthalmic goiter.
5. The human will suffer from simple goiter.
6. This leads to decreasing in secretion of thyroxin hormone which leads to the suffering from simple goiter.
7. The adrenal glands secrete adrenalin hormone which stimulates body's organs to respond to emergencies.
8. The level of glucose sugar in blood decreases.
9. Pancreas responses by secreting glucagon hormone to raise the percentage of glucose sugar in blood.
10. The glucose sugar level in blood increases and human will suffer from diabetes.
11. The glucose sugar level in blood decreases.
12. Pancreas responses by secreting insulin hormone to reduce the percentage of glucose sugar in blood.
13. The male secondary sex characters will not be appeared.
14. The female secondary sex characters will not be appeared.
15. The bacterial cells multiply, then the human growth hormone produced in large amount which separated and purified to be used to treat dwarf persons, in what is known as genetic engineering.

9

1. They control and organize most of the vital activities and functions in the bodies of living organisms.
2. They secrete the hormones in the human body.
3. It secretes hormones that regulate the activities of most of other endocrine glands, so it is called the master gland (the main gland).
4. - It controls the speed of growth rate of body muscles, bones and other organs.
   - It determines the height that the person will reach when becomes a fully grown.
5. They stimulate mammary glands to secrete milk during breast feeding process.
6. They affect the development of sex organs prior to adulthood stage.
7. It stimulates thyroid gland to secrete its hormones.
8. It secretes thyroxin hormone and calcitonin hormone.
9. It plays a main role in food assimilation processes in the body, where it liberates the energy necessary for the human body from food.
10. It is rich in iodine element that enters in thyroxin hormone's structure.
11. It controls the level of calcium in the blood.
12. It stimulates body's organs to respond to emergencies.
13. It secretes digestive enzymes that help in digestion process and it also secretes insulin and glucagon hormones which regulate the glucose sugar level in the blood.
14. It stimulates the storage of glucose sugar in liver in the form of glycogen.
15. It stimulates the convertion of the stored glycogen into glucose sugar that releases into the blood stream.
16. It appears the female secondary sex characters.
17. It promotes the growth of endometrium.
18. It appears the male secondary sex characters.

10

1.

Pituitary gland	Thyroid gland
It secretes hormones that regulate and organize the activities of most of other endocrine glands.	It secretes thyroxin hormone which plays a main role in food assimilation processes in the body and also calcitonin hormone which controls the level of calcium in the blood.

2. *Look at the main book on page* (240).
3. *Look at the main book on page* (242).
4.

Points of comparison	Insulin hormone	Glucagon hormone
Reason for secretion :	It is secreted when the level of glucose sugar increases in the blood.	It is secreted when the level of glucose sugar decreases in the blood.
Function :	It stimulates the storage of glucose sugar in liver.	It stimulates the release of glucose sugar from the liver.

5. ***Answer by yourself.***

6.

Points of comparison		Exophthalmic goiter	Diabetes
Reason :		Increase in the secretion of the thyroxin hormone with large amounts.	Decrease in the secretion of the insulin hormone which leads to the cells are unable to use glucose, so the result is the increasing in the level of glucose in blood.
Symptoms :		Enlargement of thyroid gland accompanied by loss of weight, tension and exophthalmoses.	Feeling very thirsty and multiple urination times.

7. ***Answer by yourself.***

8.

Points of comparison	Testes	Ovaries
The produced hormones :	Testosterone	Estrogen and progesterone.
The function :	It appears the male secondary sex characters.	- Estrogen appears the female secondary sex characters. - Progesterone promotes the growth of endometrium.

11 1. Dwarfism. 2. Gigantism.
3. Simple goiter. 4. Exophthalmic goiter.
5. Diabetes.

12 1. Growth hormone.
2. Thyroid stimulating hormone.
3. The activating hormone of sexual glands.
4. Thyroxin hormone.
5. Calcitonin hormone.
6. Adrenalin hormone. 7. Insulin hormone.
8. Glucagon hormone.
9. Estrogen hormone.
10. Progesterone hormone.
11. Testosterone hormone.

13 1. ***Answer by yourself.***
2. ***Look at the main book on page*** **(238).**

3.

The gland	The location
(a) Thyroid gland.	In the front surface of the neck on both sides of the trachea.
(b) Pituitary gland.	Below the brain.
(c) Adrenal glands.	Adhering to the top of kidney.
(d) Pancreas.	Between the stomach and the small intestine.

4.

Description	Reason
(a) The body stops growing, so the person becomes a dwarf.	Decrease of secretion in the growth hormone at the childhood.
(b) A continuous growth in the limbs' bones, so the person becomes a giant.	Increase of secretion in the growth hormone at the childhood.
(c) Enlargement of thyroid gland and the neck.	Decrease of secretion in the thyroxin hormone due to the lack of iodine from food as it enters in the hormone's structure.
(d) Enlargement of thyroid gland accompanied by lose of weight, tension and exophthalmoses.	Increase of secretion in the thyroxin hormone with large amounts.
(e) Feeling very thirsty and multiple urination times.	Decrease in the secretion of the insulin hormone from pancreas, which leads to increasing the level of glucose sugar in blood as a result of the cells are unable to use glucose.

5. ***Look at the main book on page*** **(246).**

14 1. (a) ① Pituitary gland.
② Thyroid gland.
③ Pancreas.
④ Adrenal gland.
⑤ Testis.
⑥ Ovary.
(b) a. (1) b. (1) c. (3) d. (1) e. (2)
f. (4) g. (3) h. (5 & 6)

2. (a) the pituitary – the brain.
(b) hormones – the master gland – the main gland.
(c) two lobes (d) The growth
3. (a) Thyroid gland.
(b) It secretes two hormones which are thyroxin and calcitonin.
4. (a) Simple goiter.
(b) & (c) ***Look at the main book on page*** **(242).**
5. (a) measuring the concentration of glucose sugar in blood immediately.
(b) 1. The reading will decrease.
2. The reading will increase.
3. The reading will decrease.
6. (a) - (X) is glucagon hormone.
- (Y) is insulin hormone.
(b) Insulin(Y) secreted when the blood glucose increases, and secreted from pancreas.
7. (a) Pancreas. (b) Liver.

Thinking Skills Questions

1 1. c 2. d 3. d 4. b

2 A ⟶ B (Insulin). D ⟶ C (Glucagon).

3 • Hepatic vein contains blood carry 30 mg.
• Hepatic portal vein contains blood carry 100 mg.

4 Because they depends on sea food in their food which is rich with iodine.

Project **On UNIT Four** *Answer by Yourself*

PART 2

Guide Answers of Worksheets

Worksheet 1

1

(A) 1. b 2. a 3. c 4. c 5. a 6. c

(B) 1. Because copper comes after hydrogen in the chemical activity series, so it can't replace the hydrogen of acids.

2. Due to the presence of a layer of aluminium oxide on aluminium surface which takes time to separate that delays the starting of the reaction.

3. Because sodium comes before hydrogen in C.A.S., so it replaces hydrogen of acids.

4. Because magnesium comes before copper in the chemical activity series, so it replaces copper in copper sulphate solution and copper precipitates as a red ppt.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

2

(A) 1. chemical reaction.

2. green – copper oxide

3. metal oxide – sulphur trioxide.

4. metal nitrite – oxygen gas.

5. mercury – oxygen

(B) It is the arrangement of metals in a descending order according to the degree of their chemical activity.

(C)

Heating of metal oxide	Heating of metal hydroxide
Metal oxide decomposes by heat into metal and oxygen gas evolves.	Metal hydroxide decomposes by heat into metal oxide and water vapour.
Ex.: $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$	Ex.: $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

3

(A) 1. $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

2. $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

3. $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

(B) 1. Thermal decomposition reactions.

2. Simple substitution reactions.

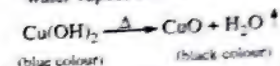
(C) 1. Hydrogen gas (H_2).

2. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat.$

3. Simple substitution reaction [A metal substitutes the hydrogen of water].

4

(A) 1. A black substance of copper oxide is formed and water vapour evolves.



$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$
(blue colour) (black colour)

2. Aluminium reacts with dil. HCl forming aluminium chloride and hydrogen gas evolves.

$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

(B) 1. $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

2. $Mg + 2HCl \xrightarrow{dil.} MgCl_2 + H_2\uparrow$

3. $2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

(C) *Look at the main book on page* (18).

Worksheet 2

1

(A) 1. gains – a negative chloride

2. white – silver chloride 3. oxidized – oxygen.

(B) 1. Reducing agent. 2. Oxidation.

2

(A) 1. d 2. d 3. b

(B) 1. Due to formation of silver chloride salt which doesn't dissolve in water.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow.$

2. Because the number of gained electrons in reduction process equals the number of lost electrons in oxidation process.

3

(A) • **The oxidizing agent** is copper oxide, because it gives oxygen to hydrogen.

• **The reducing agent** is hydrogen, because it takes oxygen from copper oxide.

(B) 1. A chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance.

2. It is a reaction between an acid and an alkali to form salt and water.

4

(A) 1. Carbon dioxide gas, it turbids clear limewater.

2. $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

(B) 1. A white ppt. of silver chloride is formed.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

2. It is oxidized and changed into a positive ion, and it became a reducing agent.

$Na \xrightarrow{Oxidation} Na^+ + e^-$

3. It is reduced and changed into a negative ion, and it became an oxidizing agent.

(C)

Oxidation	Oxidizing agent
It is a chemical process which causes the increase in the oxygen percentage or the decrease in the hydrogen percentage in a substance.	It is the substance which gives oxygen or takes hydrogen away during the chemical reaction.

Worksheet 3

1

(A) 1. Ionic – covalent　　2. reactants – resultants

(B) 1. d　　2. b

2

(A) 1. The nature of the reactants.
2. The concentration of the reactants.
3. The temperature of the reaction.
4. Catalysts.

(B) $2NaOH + CuSO_4 \longrightarrow Na_2SO_4 + Cu(OH)_2\downarrow$
(blue colour)　　(blue ppt.)

By the disappearance rate of the blue colour of copper sulphate (reactant) or the appearance rate of the blue precipitate of copper hydroxide (resultant).

3

(A) 1. Because the reactions of ionic compounds take place between ions, while the reactions of covalent compounds take place between molecules.

2. Because the surface area of iron filings exposed to reaction with acid is larger than the surface area of iron piece and the speed of chemical reaction increases by increasing the surface area exposed to reaction.

(B) It is the change in the concentration of the reactants and resultants at a unit time.

4

(A) 1. ① X　　② Z　　③ Y
2. • X decreases gradually.
• Y increases gradually.

(B) *Look at the main book on page* (59).

Worksheet 4

1

(A) 1. The rate of decomposition of hydrogen peroxide increases, because the oxidase enzyme in sweet potato acts as a catalyst.

2. The speed of chemical reaction increases, because by increasing the temperature, the number of collisions between molecules increases.

(B) 1. platinum　　2. cold – hot

(C) *Look at the main book on page* (67).

2

(A) *Look at the main book on page* (64).

(B) 1. (2) < (3) < (1)

2. In tube (1), because the rate of the chemical reaction increases by increasing the concentration of the reactants.

3

(A) 1. Because the low temperature in freezer of the fridge slows down the speed of chemical reactions that done by bacteria which cause the rot of food.

2. Due to increasing the speed of chemical reaction by increasing the concentration of oxygen gas.

(B) Experiment (3), because the rate of chemical reaction increases by increasing the temperature of the reaction, the surface area of reactants exposed to reaction and the concentration of the reactants.

4

(A) 1. b　　2. d　　3. c

(B) 1. hydrogen gas (H_2).

2. The speed of the reaction increases as the concentration of the reactants increases due to the increase of the number of collisions between molecules.

(C) - It is a substance which changes the rate of the chemical reaction without changing or being used up.
- Types :
• Positive catalytic reactions.
• Negative catalytic reactions.

General Exercise of the School Book on Unit One

1 1. the chemical reaction.
2. increases
3. concurrent

2 1. increases.　　2. metal oxide　　3. faster

3 1. Thermal decomposition reactions.
2. Speed of chemical reaction.
3. Catalyst.　　4. Reduction.

4 1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$
2. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$
3. $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
4. $NaOH + HCl \longrightarrow NaCl + H_2O$

5 1. Because aluminium comes before hydrogen in C.A.S. so, it replaces the hydrogen of diluted HCl.

$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

2. Because the surface area of iron filings exposed to reaction with acid is more than the surface area of iron piece and the speed of chemical reaction increases by increasing the surface area exposed to reaction.

3. Because the low temperature in freezer of the fridge slows down the speed of chemical reactions that done by bacteria which cause the rot of food.

6 1.

Simple substitution reactions	Double substitution reactions
They are chemical reactions in which one of the elements substitutes another less active element in a solution of one of its compounds.	They are chemical reactions in which double exchange occurs between the ions of two different compounds to give two other new compounds.

2.

Heating of metal oxide	Heating of metal hydroxide
Metal oxide decomposes by heat into metal and oxygen gas evolves.	Metal hydroxide decomposes by heat into metal oxide and water vapour.
Ex : $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$	Ex : $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

Model Exam 1 on Unit One

1 (A) 1. The speed of chemical reaction.
2. Chemical reaction.
3. Reducing agent.　　4. Catalyst.

(B) 1. X. $NaNO_3$　　Y. O_2

2. First equation ⟶ double substitution reaction.
Second equation ⟶ thermal decomposition reaction.

(C) To change (increase or decrease) the speed of the chemical reaction.

2 (A) 1. metal oxide – sulphur trioxide.
2. 100 – zero
3. water – sodium bicarbonate.
4. salt – water

(B) 1. Hydrogen gas.　　2. Sodium chloride.
3. Tube (1) : Simple substitution reaction.
$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + heat$
Tube (2) : Double substitution reaction.
$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

(C) It is a substance which changes the rate of the chemical reaction without changing or being used up.

3 (A) 1. (✗)　　2. (✓)　　3. (✓)　　4. (✗)

(B) a. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$
b. 1. $NaNO_3$　　2. O_2　　3. $NaNO_2$

(C) • The nature of the reactants.
• The concentration of the reactants.
• The temperature of the reaction.
• Catalysts.

4 (A) 1. b　　2. c　　3. d　　4. b

(B) 1. Using a catalyst (manganese dioxide).
2. Adding oxidase enzyme which exists in sweet potato.

(C) By adding silver nitrate solution, if a white precipitate is formed.
∴ It is sodium chloride solution.
$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl \downarrow$ white ppt.

Model Exam 2 on Unit One

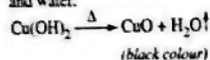
1 (A) 1. increases – collisions
2. catalyst – H_2O_2
3. green – black.
4. The kind of bonding in reactants – surface area of reactants.

(B) 1st way by using iron filings instead of a cube of iron.
2nd way by using concentrated HCl acid instead of diluted HCl acid.

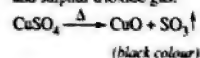
(C) Because the speed of chemical reaction increases by increasing the surface area exposed to reaction.

2 (A) 1. (✗) 2. (✗) 3. (✓) 4. (✓)

(B) 1. - In tube (1), copper hydroxide decomposes by heating into copper oxide (black substance) and water.


$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$ *(black colour)*

- In tube (2), copper sulphate decomposes by heat into copper oxide (black substance) and sulphur trioxide gas.


$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$ *(black colour)*

2. Thermal decomposition reactions.

(C) They are chemical reactions which involve the breaking up of the compounds by the effect of heat into simple elements or simpler compounds than the original ones.

3 (A) 1. Chemical activity series.
2. Neutralization reaction.
3. Enzymes.
4. Oxidation process.

(B) 1. (B) $NaNO_3$ (D) O_2
2. Precipitate is silver chloride (AgCl).
Salt is sodium nitrite ($NaNO_2$).
3. First : Double substitution reaction.
Second : Thermal decomposition reaction.

(C) They act as catalysts that increase the speed of biological reactions.

4 (A) 1. Fireworks 2. H_2
3. increasing 4. copper oxide

(B) 1.

$2NaN_3 \xrightarrow[\text{spark}]{\text{Electric}} 2Na + 3N_2\uparrow$
2. ① Sodium azid. ② Sodium.
③ Nitrogen gas.
3. It is one of the most important safety means in cars at emergencies.

(C) *Look at the main book on pages* (32 & 33).

Worksheet 5

1

(A) 1. To measure the electric current intensity passing through the circuit.
2. To measure the electromotive force of the battery.
3. Because it doesn't pollute the environment.

(B) 1. The electric current.
2. Electrons. 3. The ampere.
4. The electric potential of a conductor.

2

(A) 1. c 2. d 3. a 4. c

(B) 1. No electric current will pass through them, because there is no potential difference between them (potential difference = zero).
2. The electric current intensity decreases to its half.

3

1. nucleus – electrons
2. voltmeter – volt. 3. high – low.
4. voltmeter – ammeter 5. coulomb.

4

1. Potential diff. (V) = $\frac{\text{Work (W)}}{\text{Amount of electricity (q)}}$

$= \frac{16600}{600} = 27.6$ volt.

2. Time = 7 × 60 = 420 sec.

Current intensity = $\frac{\text{quantity of charge (q)}}{\text{Time (t)}}$

$18 = \frac{q}{420}$

q = 18 × 420 = 7560 coulomb.

3. Time = 3 × 60 = 180 sec.

$I = \frac{q}{t} = \frac{600}{180} = 3.33$ amp.

Worksheet 6

1

(A) *Look at the main book on pages* (104 & 105).

(B) 1. 1 ohm. 2. ohmmeter 3. directly

2

(A) 1. c 2. a 3. b 4. a 5. d

(B) 1. It is the resistance of a conductor which allows passing an electric current intensity of one ampere when the potential difference between its terminals is one volt.
2. It is the opposition that the electric current faces during its passing through a conductor.
3. It is the potential difference across the two terminals of a conductor whose resistance is one ohm and the current intensity passing through it is one ampere.

3

(A) 1. d-B 2. c-A 3. a-D

(B) 1. $R = \frac{V}{I}$ $22 = \frac{V}{10}$

V = 22 × 10 = 220 volt.

2. $I = \frac{V}{R} = \frac{220}{1000} = 0.22$ amp.

$\because I = \frac{q}{t}$

∴ q = I × t = 0.22 × 30 × 60 = 396 coulomb

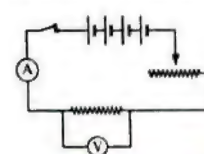
3. $R = \frac{V}{I}$

V = I × R = 10 × 30 = 300 volt.

4

(A) 1. The current intensity decreases.
2. The current intensity and the potential difference can't be controlled and it doesn't verify Ohm's law.
3. The current intensity is doubled.

(B) 1. (1) Open key. (2) Fixed resistance.
(3) Battery. (4) Ammeter.
(5) Voltmeter. (6) Variable resistance (rheostat)

2.


Worksheet 7

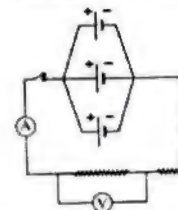
1

1. direct – alternating 2. the kinetic – electric
3. series – parallel 4. positive – second
5. E_1 6. direct

2

(A)

The direct current (D.C.)	The alternating current (A.C.)
1. It is unidirectional and has constant intensity. 2. It is used in electroplating processes and in some operating electric appliances.	1. It is variable in direction and intensity. 2. It is used in lighting and in operating electric appliances.

(B) 1.


2. By using rheostat. 3. Parallel connection.
4. 2 volt.

3

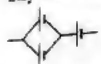
(A) 1. Because, it can be transferred for long distances and it can be changed into direct current.
2. Because the e.m.f. in case of series connection is equal to the number of the cells × the e.m.f. of one cell, while the e.m.f. in case of parallel connection is equal to the e.m.f. of one cell

(B) 1. (✗) .... chemical energy is changed ....
2. (✓)
3. (✗) .... in parallel ....

1

1. a. All cells are connected in parallel.

b. Two cells are connected in parallel and they connected in series with the third.

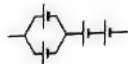


c. All cells are connected in series.

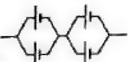
2. a. In series connection.
   e.m.f. = 1.5 × 3 = 4.5 volt.
   b. In parallel connection.
   e.m.f. = 1.5 volt.

3. a. All the cells are connected in series.

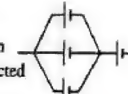
b. Two cells are connected in parallel and the both are connected in series with the third and the fourth.



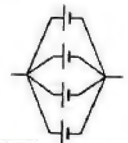
c. – **The first way :**
Two cells are connected in parallel and the other twice also are connected in parallel then the two groups are connected in series.



– **The second way :**
Three cells are connected in parallel and they are connected in series with the fourth.



d. All the cells are connected in parallel.



Worksheet 8

1

(A) 1. series. 2. alternating current.
3. electric energy. 4. two poles.

(B) 1. (✗) .... in parallel ....
2. (✗) .... the sliding rheostat.

2

(A) 1. The volt. 2. Sliding rheostat.

(B) 1. Current intensity (I) = $\frac{\text{Quantity of charge (q)}}{\text{Time in seconds (t)}}$

2. Potential difference (V) = $\frac{\text{Work (W)}}{\text{Quantity of charge (q)}}$

3. Electric resistance (R) = $\frac{\text{Potential difference (V)}}{\text{Current intensity (I)}}$

3

(A) 1. d 2. b 3. c 4. b

(B) 1. electric
2. directly proportional relation

4

(A) *Look at the main book on pages* (104 & 105).

(B) 1. The current intensity increases to the double.
2. The potential difference increases to four times.

(C) q = 500 coulomb , R = 3 ohm.
I = 2 ampere , W = ?
V = R × I = 3 × 2 = 6 volt.
W = V × q = 6 × 500 = 3000 Joule.

Worksheet 9

1

(A) 1. It is the measuring unit of absorbed nuclear radiation.
2. It is the spontaneous decaying of the atom's nuclei of some radioactive elements that are present in the nature in an attempt to achieve a more stable composition.

(B) 1. (✗) 2. (✗) 3. (✓)

2

(A)

Genetic effects	Cellular effects
They are changes in the sex chromosomes composition which result in abnormal birth.	They are changes in the cells composition which lead to destroying the cells.

(B) 1. d 2. a 3. b 4. a

3

1. The natural radioactivity is produced from the radioactive elements present in nature, while artificial radioactivity is produced from nuclear reactions and nuclear bombs.

2. To prevent the spread of radiation to other areas.
3. Due to their excess energy as a result of their atoms' nuclei containing neutrons more than required for their stabilization.
4. Due to the transference of polluted atomic cloud by the wind, when rain fell, radioactive isotopes transferred to the soil and polluted plants, then animals and their milk and meat were polluted.
5. Due to nuclear binding force which overcomes the repulsion force between protons.

4

1. physical – chemical 2. treatment – diagnoses
3. radiation – environment. 4. protons – neutrons.
5. cement – rocks

5

(A) *Look at the main book on page* (172).

(B) 1. To treat and diagnose diseases like cancer.
2. It is used to eliminate pests and to improve some plants races.
3. • To convert sand to silicon sheets which is used in manufacturing of computer processors and programmed electric circuits that are used in electric appliances.
   • To discover defects in the manufactured products.
4. The nuclear energy is used to heat water to produce steam. This steam is used to operate turbines to generate electricity.

General Exercise of the School Book on Unit Two

1

1. The electric current.
2. The direct electric current.
3. Ohm.
4. Ampere.
5. Ammeter.
6. The electric potential.
7. The volt.
8. The Sievert.
9. The natural radioactivity.

2

1. a 2. a
3. c 4. c
5. b 6. a
7. c

3

1. Because the alternating current can be :
   - Converted into direct current.
   - Transferred for short and long distances.
2. To measure the electromotive force of the battery.
3. To control the value of the electric resistance.
4. To obtain the maximum electromotive force.
5. To obtain the electromotive force of one cell only and to obtain low electromotive force.
6. Because in series connection $E_{(battery)} = E_1 + E_2 + E_3 + ...$
   and in parallel connection $E_{(battery)} = E_1$
7. Because they contain number of neutrons more than the number required for their stability that make them unstable due to its excess energy, so they emit radiation.
8. Because radiation change the chromosomes composition.

4

$R = \frac{V}{I}$ ∴ V = R × I = 22 × 10 = 220 volt.

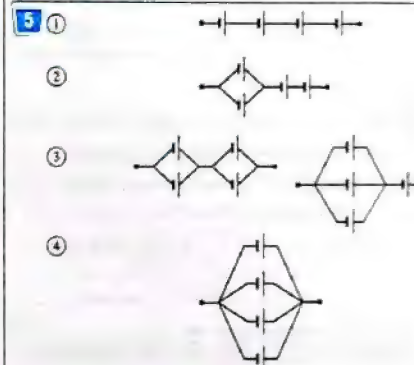
5

①

②

③

④



Model Exam 1 on Unit Two

1

(A) 1. ammeter – ampere.
2. The electric resistance.
3. direct – alternating
4. Voltmeter – the potential difference – the rheostat

(B) a. 1. Parallel connection.
2. Series connection.
b. (B)

(C) This means that the potential difference between the two poles of the car battery when the electric circuit is open is 12 volt.

2 (A) 1. a 2. b 3. b 4. d

(B) 1. a. Alternating current.

b. Direct current.

2. a 3. b

(C) Because they have excess energy because the number of neutrons is more than the number required for its stability.

3 (A) 1. Direct current.

2. The potential difference.

3. Physical effects.

4. The protons.

(B) 1. Fixed resistance $R = \frac{V}{I} = \frac{8}{2} = 4$ ohms.

2. No, because it doesn't contain rheostat.

(C) When the resistance is burnt, no electric current will pass in the electric circuit (opened circuit), so the reading of ammeter = zero, while the reading of voltmeter is equal to the e.m.f of the battery.

4 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✗)

(B) The illumination of the lamp increases, because the resistance decreases, so the current intensity increases.

(C) $R = \frac{V}{I}$ $\therefore I = \frac{V}{R} = \frac{220}{2200} = 0.1$ amp.

$q = I \times t = 0.1 \times 2 \times 60 = 12$ coulomb.

Model Exam 2 on Unit Two

1 (A) 1. b 2. d 3. d 4. a

(B) 1. $R = \frac{V}{I} = \frac{6}{2} = 3$ ohm.

2. $q = I \times t = 2 \times 30 = 60$ coulomb.

(C) Because if we increase the length of the wire, the resistance increases and the current intensity decreases and vice versa.

2 (A) 1. natural – artificial 2. dynamo – dry cell

3. cellular – genetic 4. joule – volt.

(B) 1. a 2. e 3. c 4. b

(C) *Look at the main book on page* (170).

3 (A) 1. Radioactivity phenomenon.

2. Isotopes.

3. Series connection.

4. Physical effects.

(B) $V = R \times I$

$= 10 \times 22 = 220$ volt.

(C) *Look at the main book on page* (100).

4 (A) 1. 1 milli Sievert per year.

2. The direct current

3. in parallel

4. Coloumb

(B) *Look at the main book on page* (104).

(C) The electric current intensity passing through a conductor is directly proportional to the potential difference across it at constant temperature.

Worksheet 10

1

1. Acquired

2. Gregor Mendel – pea – hermaphrodite

3. segregation of factors.

4. hereditary factors – gametes.

5. acquired – hereditary

6. Genetics

2

(A) *Look at the main book on page* (193).

(B) 1. (GG) : pea plant of green pods (pure)

(gg) : pea plant of yellow pods (pure)

2. (1) Gg (2) Gg

(3) Gg (4) gg

3. a : Mixed-pollination.

b : Self-pollination.

3

(A) *Look at the main book on page* (195).

(B) 1. To prevent cross-pollination with other flowers.

2. Because :

- It is easy to be planted and it grows fast.
- Its life cycle is short.
- Its flowers are hermaphrodite, so it can be self-pollinated.
- It can easily be artificially pollinated (human intervention).
- It produces large number of plants in a generation.
- It has several pairs of easily identified contrasting traits.

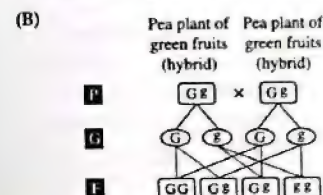
4

(A) 1. When two individuals of any one pair of hereditary traits are different from each other, only dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

2. It is the appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed and one of them carries a pure trait contrasting the trait carried by the other individual.

3. It is the individual that carries a different (contrasting) pair of genes, one is dominant and the other is recessive and the dominant trait (impure) appears on the individual.

(B)



5 *Look at the main book on page* (192).

Worksheet 11

1

(A) 1. d 2. a 3. c 4. d 5. a 6. d

(B) 1. carotene 2. 99% 3. The human genome

2

(A) 1. Because the gene of the free ear lobe dominates over the gene of the attached ear lobe if they are both present together in an individual.

2. Because the gene of red flower trait dominates over the gene of white flower trait in pea plant, according to the principle of complete dominance.

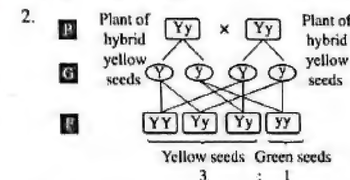
3. Because the gene of the ability to roll the tongue dominates over the gene of the non-ability to roll the tongue if they are both present together in an individual.

(B) *Look at the main book on page* (207).

3

(A) 1. *Answer by yourself.*

2.



(B) Solving the problem of malnutrition produced from deficiency of vitamin (A).

(C) 1. (A / gg) , (B / GG) , (C / Gg) , (D / gg)

2. • Family mice (P) : (Gg , Gg , Gg , Gg)

• Family mice (Q) : (GG , Gg , GG , Gg)

• Family mice (R) : (Gg , Gg , gg , gg)

4

(A) *Look at the main book on pages* (200 & 201).

(B) The gene of the presence of facial dimples dominates over the gene of absence of facial dimples, if they both present in an individual.

(C) *Look at the main book on page* (209).

5

(A) 1. (✗) Mendel's second law ....

2. (✗) .... is inherited independently ....

3. (✗) The free ear lobe ....

(B) *Look at the main book on page* (207).

(C) 1. The genes.
2. The chromosome.
3. A model of watson and Crick for composition of DNA molecule.
4. Gametes.

General Exercise of the School Book on Unit Three

1 (✗) The hereditary traits ....

2 1. The principle of complete dominance.
2. Acquired traits.
3. Genes.

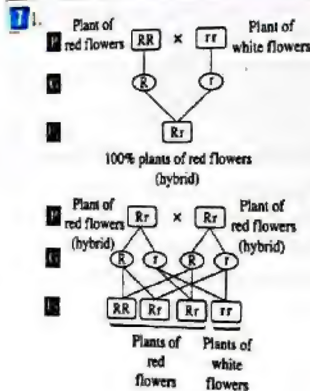
3 *Look at the main book on page* (193).

4 1. *Look at the main book on pages* (200 & 201).
2. *Look at the main book on page* (207).

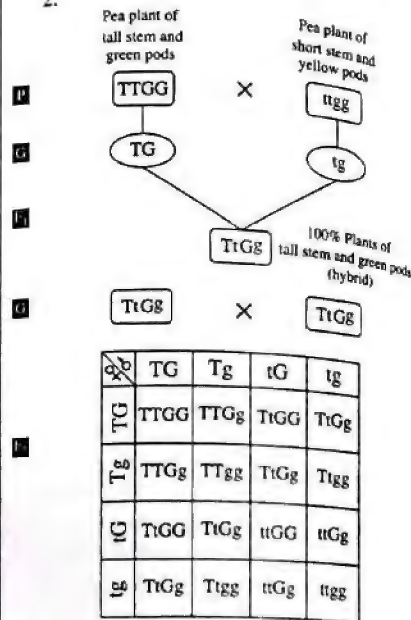
5 *Look at the main book on page* (195).

6 1. *Answer by yourself.*
2. Because the trait of tall stem dominates over the trait of short stem according to the principle of complete dominance.
3. Because the gene of the free ear lobe dominates over the gene of the attached ear lobe if they are both present together in an individual.

7 1.



2.



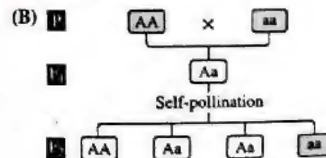
♂/♀	TG	Tg	tG	tg
TG	TTGG	TTGg	TtGG	TtGg
Tg	TTGg	TTgg	TtGg	Ttgg
tG	TtGG	TtGg	ttGG	ttGg
tg	TtGg	Ttgg	ttGg	ttgg

Pea plants of tall stem and green pods		Pea plants of tall stem and yellow pods		Pea plants of short stem and green pods		Pea plants of short stem and yellow pods
9	:	3	:	3	:	1

Model Exam on Unit Three

1 (A) 1. DNA
2. dominant trait.
3. dominant – recessive
4. acquired – hereditary
5. enzyme – protein

(B)



(C) *Look at the main book on page* (195).

2 (A) 1. acquired traits.
2. independent assortment of hereditary factors.
3. Watson and Crick.
4. Pure

(B) 1. • Dominant trait : Absence of freckles trait.
• Recessive trait : Presence of freckles trait.
2. • (2) & (4) : ff
• (1) & (3) : Ff
3. a. (1) & (3) b. (2) & (4)
c. (2) & (4)
4. Because the gene of absence of freckles (F) dominates over the gene of presence of freckles (f) if they are both present together in an individual.

(C) They produce individuals carry the ability to roll the tongue trait.

5 (A) 1. Genes. 2. Genetics.
3. Gametes. 4. Human genome.

(B) (a) 1. Gene 2. DNA 3. Chromosome.
(b) Nucleotides.
(c) DNA binds with protein.

(C) Because rice doesn't contain pro-vitamin (A) which is known as carotene that is changed into vitamin (A) in the body.

6 (A) 1. (✗) 2. (✓) 3. (✓) 4. (✗)
(B) *Answer by yourself.*
(C) *Look at the main book on page* (209).

Worksheet 12

1
1. gigantism.
2. thyroxin – thyroid.
3. diabetes.
4. estrogen – testosterone.
5. endocrine glands.
6. glucagon.
7. hormone – calcitonin

2
(A) 1. It is a chemical substance (or a chemical message) that controls and organizes most of the vital activities and functions in the bodies of living organisms.
2. A disease caused due to the decrease in the secretion of insulin hormone, which leads to increasing the level of glucose sugar in blood and its existence with the urine.
3. They are ductless glands that secrete their hormones directly in the blood without passing through ducts.

(B) 1. a 2. b 3. b 4. d

3
(A) 1. Two ovaries glands.
2. Pituitary gland.
3. Pituitary gland.

(B) 1. Because the pancreas acts as a ductless gland which secretes the insulin and glucagon hormones directly to the blood (that regulate the glucose sugar level in blood), and it also secretes digestive juices to the pancreatic duct (that help in digestion process).
2. Because they secrete adrenalin hormone which stimulates body's organs to respond to emergencies.
3. Because it secretes hormones that regulate the activities of most of other endocrine glands.

4
(A) 1. glycogen. 2. Pituitary gland
3. Thyroxin 4. Hormones
5. Pancreas

(B) Symbol : W.
The name of this hormone : Glucagon.

General Exercise of the School Book on Unit Four

1 1. endocrine glands.
2. hormone.
3. hormone
4. dwarfism.
5. glucagon
6. thyroxin – thyroid.
7. insulin

2 1. Hormone. 2. Endocrine glands.
3. Hormonal disorder. 4. Pituitary gland.

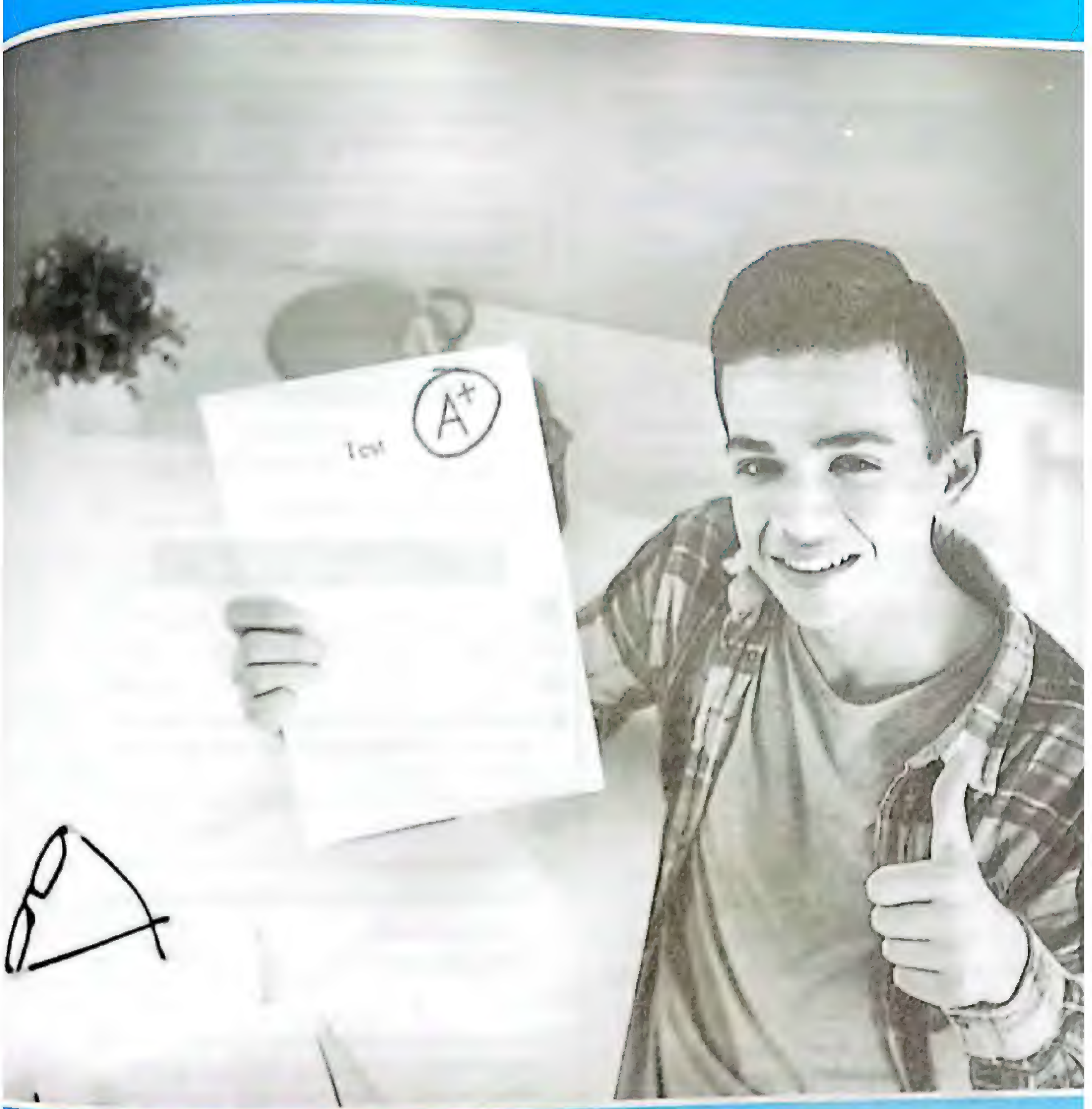
3 1. (✗) Pituitary gland ....
2. (✓)
3. (✗) .... by pancreas gland.
4. (✗) The iodine ....

4 1. Due to the increase of growth hormone secreted from the pituitary gland at the childhood, which known as gigantism.

PART

3

Guide Answers of Final Examinations



1 Cairo Governorate

1

(A) 1. salt 2. dominant
3. Pituitary 4. $FeCl_2 + H_2\uparrow$
5. segregation of factors.

(B) 1. It is the condition (state) of an electric conductor that shows the transfer of the electricity from or to it when it is connected to another conductor.
2. It is the arrangement of metals in a descending order according to the degree of their chemical activity.

(C) Time = 4 × 60 = 240 sec.

Current intensity (I) = $\frac{\text{quantity of charge (q)}}{\text{time (t)}}$

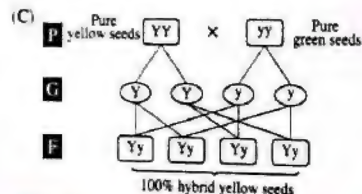
$= \frac{2400}{240} = 10$ amp.

2

(A) 1. b 2. c 3. d 4. a 5. b

(B) 1. Because by increasing the temperature, the number of probable collisions between reactants molecules increases, so the speed of reaction increases.
2. Because : - it can be transferred for long distances through wires.
- it can be changed into a direct current.

(C)



3

(A) 1. Catalysts. 2. Chromosome
3. Sievert. 4. Endocrine glands.
5. Reduction process. 6. Dominant trait.

(B) 1. A white precipitate of silver chloride is formed

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

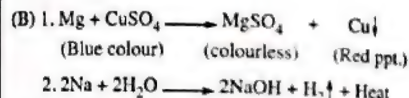
2. Pancreas responses by secreting glucagon hormone to raise the percentage of glucose sugar in blood.

(C) a. Cells connected in series :
$E_{(battery)} = n \times E_1 = 1.5 \times 3 = 4.5$ volt.
b. Cells connected in parallel :
$E_{(battery)} = E_1 = 1.5$ volt.

4

(A) 1. Voltmeter is a device used to measure the electromotive force.
2. The increase in secretion of thyroxin hormone leads to exophthalmic goiter disease.
3. The radioactive element nuclei contain a number of neutrons more than the number required for stability.
4. Acquired traits that aren't transmitted from one generation to another.
5. Hybrid individual carries one dominant gene and other is recessive
6. Oxidizing agent is the substance which gains an electron or more during a chemical reaction.

(B) 1.



$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$
(Blue colour) (colourless) (Red ppt.)

2. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + Heat$

(C) *Look at the main book on page (133)*

2 Giza Governorate

1

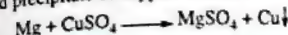
(A) 1. Joule 2. recessive 3. DNA 4. 9
(B) 1. (✓) 2. (✗) 3. (✓) 4. (✓)
(C) This means that the potential difference between the two poles of the electric cell when the circuit is open is 1.5 volt.

2

(A) 1. Negative catalyst
2. Radioactivity phenomenon (Natural radioactivity)
3. Series connection
4. Reduction process
(B) 1. a 2. a 3. c 4. c
(C) No electric current will pass through them, because there is no potential difference between them (potential difference = Zero).

3

(A) 1. adrenalin 2. sievert
3. two testes glands 4. 15
(B) 1. 75% 2. AgCl
3. stamens 4. increasing the temperature.
(C) The blue colour of copper sulphate disappears and a red precipitate of copper is formed.



$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

4

(A) 1. c 2. d 3. a 4. b
(B) 1. Child No. [1] 2. 220
3. Ohmmeter
4. 50% smooth hybrid seeds : 50% wrinkled seeds.
(C) Due to the decomposition of red mercuric oxide by heating into mercury (silvery precipitate) and oxygen gas evolves.

$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

3 Alex. Governorate

1

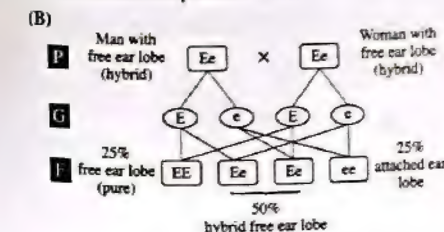
(A) 1. nuclei - radioactivity phenomenon (natural radioactivity)
2. Concentration 3. hereditary factors.
(B) 1. An effervescence occurs due to evolving of bubbles of carbon dioxide gas.

$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

2. This will lead to the infection with the diabetes diseases.
(C) 1. b 2. d 3. e 4. c

2

(A) 1. Chemical activity series
2. Progesterone
3. Potential difference across a conductor.
4. Covalent compounds.
(B)



(C) 1. $R = \frac{V}{I} = \frac{6}{2} = 3$ ohm.
2. $\because I = \frac{q}{t}$
$\therefore q = I \times t = 2 \times 30 = 60$ coulomb

3

(A) 1. a 2. c 3. d 4. b
(B) 1. (X) : $NaNO_3$ / (Y) : O_2
2. Type of reaction.
- in first equation : Double substitution reaction.
- in second equations : Thermal decomposition reaction.
(C) 1. Adrenal gland
2. Adrenalin hormone : Stimulates body's organs to respond to emergencies.

4

(A) 1. Kinetic 2. metal oxide
3. nucleus 4. natural
(B) 1. Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which cause the rot of food.
2. To obtain a battery, the e.m.f of it is low.
(C) 1. It is the substance which takes oxygen away or gives hydrogen during a chemical reaction. or it is the substance which loses one electron or more during a chemical reaction.
2. They are the traits that aren't transmitted from one generation to another.

4 El-Qalyoubia Governorate

1

(A) 1. d 2. c 3. a 4. a
(B) 1. electron 2. adrenalin
3. fast 4. thyroxin
(C) 6 volt

2

(A) 1. natural 2. mercuric oxide
3. coulomb 4. oxygen
(B) 1. (✗) 2. (✓) 3. (✗) 4. (✗)
(C) A direct electric current is produced.

3

(A) 1. (1) pituitary gland (2) pancreas

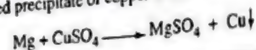
(3) Stimulates the release of glucose sugar from the liver

(4) progesterone

2. (1) 3 volt (2) 4.5 volt

(B) 1. e 2. f 3. g 4. a

(C) The blue colour of copper sulphate disappears and a red precipitate of copper is formed.



$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

4

(A) 1. The speed of chemical reaction

2. Isotopes

3. Chemical activity series

4. Electric current intensity

(B) 1. a. the chromosome b. DNA

c. the hereditary (genetic) traits d. gene

2. (B) / $R = \frac{V}{I}$

(C) • The produced gas : H_2

• $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

5 Menofia Governorate

1

(A) 1. Electric potential of a conductor.

2. Genes

3. The coulomb

4. Hybrid individual.

(B) First : a. Sodium nitrate ($NaNO_3$)

b. white colour.

c. Sodium nitrite ($NaNO_2$)

d. yellowish white colour.

Second : 1. Pancreas gland

2. Insulin

3. Glucagon

(C) w = 200 joule, t = 2 sec., v = 20 volt, I = ?

$q = \frac{w}{v} = \frac{200}{20} = 10$ coulomb

$\therefore I = \frac{q}{t} = \frac{10}{2} = 5$ amp.

2

(A) 1. e 2. d 3. a 4. b

(B) 1. independent assortment of hereditary factors.

2. less than

3. more than

4. acquired traits

(C) 1. decreases. 2. increases. 3. doesn't change

3

(A) 1. adrenal 2. chemical

3. Dwarfism 4. remains constant

(B) First : a. Oxidation process

b. Simple substitution reaction

Second : [1] Yy [2] Yy [3] yy [4] yy

(C) 1. Because the oxidase enzyme in sweat potato acts as a catalyst which increases the rate of decomposition of hydrogen peroxide into water and oxygen gas.

2. Due to the presence of a layer of aluminium oxide (Al_2O_3) on aluminium surface, which takes time to separate from aluminium, which delays the starting of occurrence of the reaction.

4

(A) 1. (✗) 2. (✓) 3. (✓) 4. (✗)

(B) 1. d 2. d 3. c 4. c

(C) 1. A. $CuCO_3$ B. CuO X. Cu

2. Reduction process.

6 Dakahlia Governorate

1

(A) 1. d 2. b 3. b 4. d

(B) 1. $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

2. $H_2 + CuO \xrightarrow{\Delta} H_2O + Cu$

3. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + Heat$

4. $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

(C)

P Man with curly hair (hybrid) Gg × gg Woman with smooth hair

G G g g g

F Gg Gg gg gg

50% curly hair 50% smooth hair

2

(A) 1. Bone marrow.

2. a catalyst

3. the ability to roll the tongue

4. glycogen in the liver cells

(B) 1. B 2. C 3. A

4. Theremal decomposition reaction.

(C) 1. The electric current intensity passing through a conductor is directly proportional to the potential difference across it at a constant temperature.

2. The change in the concentration of the reactants and the resultants in a unit time.

3

(A) 1. increasing the number of probable collisions.

2. blood

3. loses one electron

4. rheostat.

(B) 1. Neutralization reaction.

2. Natural radioactivity.

3. Electric potential of a conductor

4. Chromosome.

(C) ***Look at the main book on page (133).***

4

(A) 1. Because the reactions of ionic compounds take place between ions

2. Because : - It can be transferred for long distances through wires.

- It can be changed into a direct current.

3. To be sure of the purity of the trait.

4. Due to the decrease in the secretion of the growth hormone at childhood.

(B) 1. close the key.

2. $I = \frac{q}{t} = \frac{10}{20} = 0.5$ ampere.

3. 1.5 volt

4. $R = \frac{V}{I} = \frac{1.5}{0.5} = 3$ ohm.

(C) 1. N_2O_5

2. HCl

7 Sharkia Governorate

1

(A) 1. Electric potential of a conductor.

2. The chromosome.

3. Potential difference across a conductor.

4. Hybrid individual

(B) 1. $FeCl_2$

2. Controls the level of calcium in blood.

3. $H_2\uparrow$

4. progesterone

(C) $\because I = \frac{q}{t}$ $\therefore q = I \times t = 5 \times 10 = 50$ coulomb

$\because q = \frac{w}{v}$ $\therefore v = \frac{w}{q} = \frac{200}{50} = 4$ volt

2

(A) 1. d 2. c 3. a 4. a

(B) 1. (✓) 2. (✗) 3. (✗) 4. (✗)

(C) ***Look at the main book on page (100).***

3

(A) 1. direct 2. thyroxin 3. 20 4. growth

(B) 1. d 2. d 3. a 4. c

(C) 1. $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

2. $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

$H_2 + CuO \xrightarrow{\Delta} H_2O + Cu\downarrow$

4

(A) 1. ions

2. length of the conductor (metallic wire coil)

3. oxygen 4. work

(B) 1. Ohmmeter 2. stigmas

3. 40 4. enzymes

(C) 1. The reason of using manganese dioxide : To act as a catalyst which increases the speed of decomposition of hydrogen peroxide into water and oxygen gas.

2. Remains constant.

8 El-Gharbia Governorate

1

(A) 1. dominant 2. voltmeter

3. gametes 4. genetic

(B) 1. The speed of chemical reaction

2. Testosterone hormone

3. Chemical activity Series

4. Endocrine glands

$R = 2200$ Ohm. $t = 60 \times 2 = 120$ sec..

$V = 220$ volt

$I = \frac{V}{R} = \frac{220}{2200} = 0.1$ ampere

$\because I = \frac{q}{t}$

$\therefore q = I \times t = 0.1 \times 120 = 12$ coulomb

2

(A) 1. b 2. c 3. a 4. b

(B) 1. (✗) 2. (✓) 3. (✓) 4. (✗)

(C) 1. The electromotive force of the cells connected in series :

$E_{battery} = n \times E_1$

$= 3 \times 2 = 6$ volt

2. The electromotive force of the cells connected in parallel :

$E_{battery} = E_1$

$= 2$ volt

3

(A) 1. brain 2. series 3. insulin 4. electrons

(B) 1. They are responsible for appearing the individual's hereditary traits.

2. It increases the speed of decomposition of hydrogen peroxidase.

3. *Look at the main book on page (209).*

4. It helps in the treatment of harmful gases emitted from the car engine.

(C) *Look at the main book on page (29).*

4

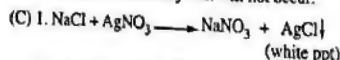
(A) 1. d 2. c 3. a 4. f

(B) 1. No electric current will pass through them, because there is no potential difference between them (potential difference = zero).

2. Cross pollination occurs in these flowers.

3. The electrons in the outer level become free.

4. The reaction which results in a protein showing a specific hereditary trait will not occur.

(C) 1.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$ (white ppt)

2.

$Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

9 Damietta Governorate

1

(A) 1. The coulomb 2. The simple cell (dry cell)

3. Dominant trait 4. Genes

(B) 1. aprecipitate 2. thyroxin

3. iron rust 4. glucagon

(C) 1. e.m.f. = 2 + 2 = 4 volt

2. $I = \frac{V}{R} = \frac{4}{10} = 0.4$ ampere

2

(A) 1. b 2. c 3. a 4. b

(B) 1. segregation of factors.

2. oxidized and reducing agent

3. 50% hybrid dominant and 50% recessive

4. Sulphur trioxide

(C) 1. No electric current will pass through them, because there is no potential difference between them (potential difference = zero)

2. This may lead to the damage of bone marrow, spleen, digestive system and central nervous system.

3

(A) 1. (✗) 2. (✓) 3. (✓) 4. (✗)

(B) 1. c 2. d 3. b 4. e

(C) 1.

$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

2. (1) $2NaNO_3$ (2) O_2 (3) $2NaNO_2$

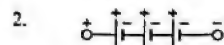
4

(A) 1. c 2. a 3. b 4. a

(B) 1. (a) The trait of each pair is inherited independently and all individuals of the first generation appear carrying the dominant traits only and in the second generation, the dominant traits and the recessive trait appear at a ratio of 3 : 1

(b) A silvery precipitate of mercury is formed and oxygen gas evolves

$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

2.


Type of connection : Series connection

(C) 1. Because aluminium comes before silver in the chemical activity series, so it substitutes silver in silver nitrate solution which leads to eroding of aluminium containers.

2. Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which cause the rot of food.

10 Kafr El-Sheikh Governorate

1

(A) 1. black 2. genes 3. Thyroid 4. $H_2\uparrow$

(B) 1. Due to the presence of a layer of aluminium oxide (Al_2O_3) on aluminium surface, which takes time to separate from aluminium, which delays the starting of occurrence of the reaction.

2. Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which cause the rot of food.

3. *Look at the main book on page (188)*

4. Because the reaction of ionic compounds takes place between ions.

(C) He discovered the emission of unseen rays from the uranium element that has the ability to penetrate solid objects.

2

(A) 1. d 2. a 3. b 4. d

(B) 1. Mercuric oxide 2. The dry cell

3. Treat and diagnose diseases like cancer (in medical field)

4. Curly hair

(C) Pituitary gland / It secretes hormones that regulate the activities of most of other endocrine glands.

3

(A) 1. Sievert 2. Catalyst

3. Ammeter 4. Acquired traits

(B) 1. It is used in lighting houses and in operating of electric appliances.

2. It is used for measuring the electromotive force of the battery.

3. It is considered as one of the most important safety means in cars at emergencies.

4. it secretes adrenalin hormone that stimulates body's organs to respond to emergencies.

(C) $NaOH + HCl \xrightarrow{dil.} NaCl + H_2O$

4

(A) 1. male 2. red

3. reactants 4. kinetic

(B) 1. (a) Alternating current (b) Direct current

2. (a)

3. (b)

(C) Pancreas responses by secreting glucagon hormone to raise the percentage of glucose sugar in blood.

11 Al-Behiera Governorate

1

(A) 1. d 2. c 3. b 4. a

(B) 1. It helps in the treatment of harmful gases emitted from the car engine.

2. protection from radiation pollution.

3. It used in lighting houses and in operating of electric appliances.

4. They are responsible for appearing the individual's hereditary traits.

(C) $\because V = \frac{W}{q} = \frac{20}{40} = 0.5$ volt

$\therefore I = \frac{V}{R} = \frac{0.5}{10} = 0.05$ ampere.

2

(A) 1. It chemically consists of a nucleic acid called DNA combined with protein.

2. It is the electric current intensity passing through a circuit when a charge of one coulomb passes through a given cross-section in one second.

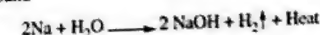
3. It is an electric current which has a constant intensity and flows in one direction in the electric circuits.

4. A chemical process where the atom loses an electron or more.

(B) 1. The electric current will flow from the conductor that has the higher electric potential to the other.

2. pancreas responses by secreting insulin hormone to reduce the percentage of glucose sugar in blood.

3. An ignition occurs accompanied by a strong pop sound


$2Na + H_2O \longrightarrow 2NaOH + H_2\uparrow + Heat$

4. The trait of each pair is inherited independently and all individuals of the first generation appear carrying the dominant traits only and in the second generation, the dominant trait and the recessive trait appear at ratio of 3 : 1

(C) The total e.m.f = 1.5 + (1.5 × 3) = 6 volt

$\therefore I = \frac{V}{R} = \frac{6}{3} = 2$ ampere

3

(A) 1. Human genome
2. The electric resistance
3. Acquired traits
4. Enzymes

(B) 1. ions
2. coulomb
3. sinuous
4. zero

(C) *Look at the main book on page (63).*

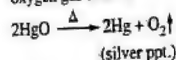
4

(A) 1. $2NaNO_2 + O_2\uparrow$
2. calcitonin
3. $MgSO_4 + Cu\downarrow$
4. increases

(B) 1. Because the gene of the ability to roll the tongue dominates over the gene of the non-ability to roll the tongue if they are both present together in an individual.

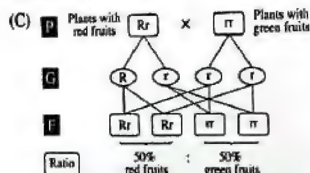
2. Because the resistance of electric conductor is directly proportional to its length.

3. Due to the decomposition of red mercuric oxide by heat into mercury (silver precipitate) and oxygen gas evolves


$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$
(silver ppt.)

4. Due to decomposition of blue copper hydroxide by heating into copper oxide (black) and water.

$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

(C)


12 Ismailia Governorate

1

(A) 1. ammeter / the potential difference across two ends of a conductor
2. direct / alternating
3. two factors / gametes.
4. dominant / recessive.

(B) 1. a. (2). B
b. (3). A
2. a. (2). C
b. (3). B

(C) $I = \frac{V}{R} = \frac{18}{9} = 2$ ampere

2

(A) 1. negative catalytic
2. $O_2\uparrow$
3. the potential difference between
4. Sievert

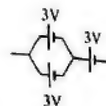
(B) 1. colour of the substance in :
– Tube (A) : silver.
– Tube (B) : Black.

2. *Look at the main book on page (29).*

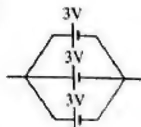
3. The hereditary traits : transmitted from one generation to another.
– Acquired traits : can't transmitted from one generation to another.

4. – Mendel's first law : law of segregation of factors.
– Mendel's second law : law of independent assortment of factors.

(C) (1) to get e.m.f = 6 volt



(2) To get e.m.f = 3 volt



3

(A) 1. Electric current intensity
2. Electrochemical cells
3. Hormone
4. Diabetes

(B) 1. a. Tube (3)
b. Double substitution reaction
2. a. child No. (1)
b. 25%

3. The reaction in case of iron filings ends in a short time than that in case of iron wire because the speed of chemical reaction increases by increasing the surface area of the reactants exposed to the reaction with humid air.

4

(A) 1. a
2. c
3. c
4. d

(B) (1) a. 1
b. 2
(2) a. Enzyme
b. protein

(C) 1. Because the low temperature in the fridge slows down the speed of the chemical reactions done by bacteria which cause the rot of food.

2. Because aluminium comes before silver in the chemical activity series, so it substitutes silver in silver nitrate solution which leads to eroding of aluminium containers.

13 Suez Governorate

1

(A) 1. hydrogen
2. natural sources / artificial sources
3. dominant trait.

(B) 1. a. A black substance of copper oxide is formed and sulphur trioxide gas evolves.

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

b. The recessive trait appears.

2. a. It consists of small parts called genes present on the chromosomes and they are responsible for appearing the individual's hereditary traits
b. They secrete the hormones in the human body.

(C) (1) The current intensity $(I) = \frac{q}{t} = \frac{600}{(5 \times 60)} = 2$ amp.

(2) The potential difference between the two points $(V) = \frac{w}{q} = \frac{3600}{600} = 6$ volt

2

(A) 1. oxygen
2. hybrid
3. glucagon
4. faster

(B) (1) 1. Due to formation of silver chloride salt which doesn't dissolve in water

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

2. *Look at the main book on page (188).*

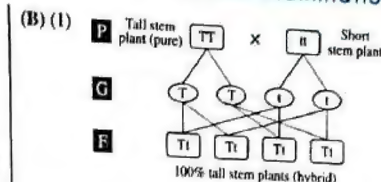
(2) 1. b
2. c

(C) 1. b
2. No reaction occurs.

3

(A) 1. c
2. b
3. a
4. a

(B) (1)



(2) 1. Cu
2. 2NaCl / $CO_2\uparrow$

(C) 1. It is a substance which changes the rate of the chemical reaction without changing or being used up.

2. It is the spontaneous decay of the atoms' nuclei of radioactive elements that are present in nature in an attempt to achieve a more stable composition.

4

(A) 1. Reduction process
2. Electric current
3. Neutralization reaction
4. Thyroid gland

(B) 1. *Look at the main book on pages (135 & 136).*
2. *Look at the main book on page (186).*

(C) 1. Fixed resistance.
2. $R = \frac{V}{I} = \frac{6}{2} = 3$ ohm.

14 Port Said Governorate

(A) 1. The electromotive force of the battery / volt
2. DNA / protein.
3. kinetic / electric
4. short / growth.

(B) 1. - The reaction of ionic compound are fast.
- Most of the reaction of cavalent compounds are slow

2.

	Dwarfism	Exophthalmic goiter
Reason	Decrease in secretion of the growth hormone at the childhood.	increase in secretion of the thyroxin hormone with large amounts.

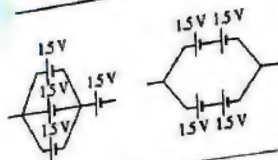
(C) V = R × I = 22 × 10 = 220 volt

2

(A) 1. The speed of chemical reaction.
2. Simple substitution reaction.
3. Electric current.
4. Radioactivity phenomenon.

(B) 1. (✗)
2. (✗)
3. (✓)
4. (✓)

(C)



3

(A) 1. c 2. b 3. b 4. c

(B) 1. They are the traits that aren't transmitted from one generation to another.

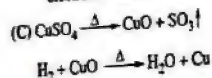
2. They are cells by which the hereditary traits are transmitted from parents to their offspring.

3. It is a reaction between an acid and an alkali to form salt and water.

4. It chemical process which causes the decrease in the oxygen percentage or the increase in the hydrogen percentage in a substance.

Or

Chemical process where the atom gains an electron or more.

(C) 

$CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

$H_2 + CuO \xrightarrow{\Delta} H_2O + Cu$

4

(A) 1. c 2. d 3. e 4. a

(B) 1. volt. 2. one

3. segregation of factors. 4. self

(C) By using a piece of zinc :

– copper sulphate : it reacts with zinc forming zinc sulphate and a red ppt. of copper.

– Magnesium sulphate : No reaction occurs.

15 Fayoum Governorate

1

(A) 1. ammeter – voltmeter 2. natural – artificial

3. recessive – dominant 4. Genetics – parents

(B) 1. Neutralization 2. metal oxide

3. Ductless 4. The iodine

(C) $I = \frac{V}{R} = \frac{220}{1000} = 0.22$ ampere

$\because t = 30 \times 60 = 1800$ sec.

$\therefore q = I \times t = 0.22 \times 1800 = 396$ coulomb

2

(A) 1. b 2. c 3. a 4. d

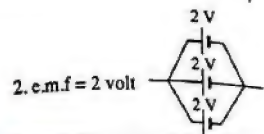
(B) 1. Reducing agent.

2. The speed of chemical reaction.

3. pea plant. 4. chromosome.

(C) 1. e.m.f = 6 volt (2 V 2 V 2 V in series)

2. e.m.f = 2 volt

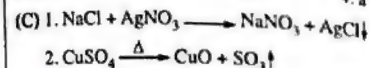


3

(A)

No	odd word	The rest
1.	Salivary glands	Endocrine glands
2.	Thyroid gland	Related to pituitary gland
3.	Pressure	Physical properties of the electric current
4.	Sodium	Some radioactive elements

(B) 1. c 2. d 3. b 4. a

(C) 1. 

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

2. $CuSO_4 \xrightarrow{\Delta} CuO + SO_3\uparrow$

4

(A) 1. The intensity of the electric current

2. The radioactive materials are used in nuclear bombs

3. Rusting of iron 4. Fireworks

(B) 1. (✓) 2. (✗) ... is sievert

3. (✓) 4. (✓)

(C) 1. The glowing of the burning match stick increases due to the evolving of oxygen gas.

2. The speed of chemical reaction increases.

16 Beni-Suef Governorate

1

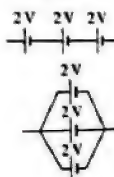
(A) 1. second 2. nuclear binding

3. gamets 4. ammeter

(B) 1. (✗) 2. (✓) 3. (✗) 4. (✓)

(C) 1. $e.m.f = n \times E_1 = 3 \times 2 = 6$ volt (2 V 2 V 2 V in series)

2. $e.m.f = E_1 = 2$ volt



2

(A) 1. c 2. b 3. c 4. a

(B) 1. recessive trait 2. hydrogen gas

3. dominant trait 4. oxygen gas

(C) $V = R \times I$

$= 20 \times 4 = 80$ volt

3

(A) 1. The electric resistance.

2. Alternating electric current.

3. Hormone.

4. pituitary gland.

(B) 1. d 2. e 3. c 4. a

(C)

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

4

(A) 1. not equal to 2. chemical

3. increase 4. e.m.f

(B) 1. c 2. b 3. d 4. c

(C) Because the reactions of ionic compounds take place between ions, while the reactions of covalent compounds take place between molecules.

17 El-Minia Governorate

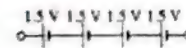
1

(A) 1. gametes 2. radiations

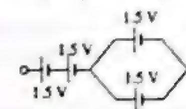
3. Dynamo 4. H_2O

(B) 1. (✓) 2. (✗) 3. (✗) 4. (✓)

(C) - Total e.m.f = 6 volt



- Total e.m.f = 4.5 volt



2

(A) 1. The speed of chemical reaction.

2. Catalytic converter.

3. The ampere.

4. The ohm.

(B) 1. pure

2. law of independent assortment of hereditary factors

3. increasing the surface area of the reactants exposed to the reaction

4. need millions of years

(C) $V = \frac{W}{q} = \frac{3330}{30} = 111$ volt.

3

(A) 1. It is used to control the current intensity and potential difference in the electric circuit.

2. Treat and diagnose diseases like cancer in medical field.

3. It stimulates body's organs to respond to emergencies.

4. It stimulates the release of glucose sugar from the liver.

(B) 1. d 2. c 3. b 4. a

(C) Because the reactions of ionic compounds take place between ions, while the reactions of covalent compounds take place between molecules.

4

(A) 1. A silvery precipitate of mercury is formed and oxygen gas evolves.

$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

2. The electric current will flow from the conductor that has higher electric potential to the other.

3. This will lead to the damage of :

- Bone marrow • spleen
- Digestive system • Central nervous system.

4. An ignition occurs accompanied by a strong pop sound.

$2Na + 2H_2O \longrightarrow NaOH + H_2\uparrow + Heat$

(B) 1. b 2. d 3. a 4. e

(C) (a) represents direct electric current / (b)

18 Assiut Governorate

1

(A) 1. b 2. a 3. a 4. c 5. c

(B) 1. No reaction occurs

2. This will lead to the damage of :

- bone marrow • spleen
- digestive system • central nervous system

3. The rate of chemical reaction increases.

PART 3

(C) 1. $2Na + Cl_2 \longrightarrow 2\,Na^+Cl^-$

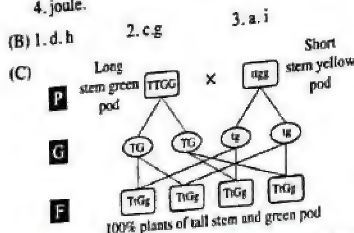
2. oxidizing agent : chlorine
Because it gains one electron during chemical reaction.
Reducing agent : sodium
Because it loses one electron during chemical reaction.

2

(A) 1. segregation of factors. 2. slower
3. treat and diagnose diseases like cancer.
4. joule. 5. zero

(B) 1. d, h 2. c, g 3. a, i

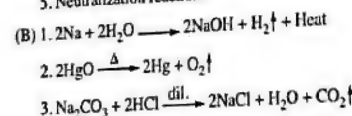
(C)



100% plants of tall stem and green pod

3

(A) 1. Catalyst. 2. Genetics.
3. The electric resistance. 4. Genes.
5. Neutralization reaction.

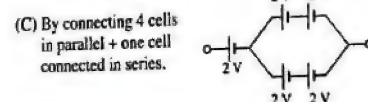


(B) 1. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + \text{Heat}$

2. $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

3. $Na_2CO_3 + 2HCl \xrightarrow{dil.} 2NaCl + H_2O + CO_2\uparrow$

(C) By connecting 4 cells in parallel + one cell connected in series.



4

(A) 1. (✗) ... to their chemical activity.
2. (✗) ... stamens from ...
3. (✓)
4. (✗) The iodine ...

(B) 1. Because aluminium comes before silver in the chemical activity series, so it substitutes silver in silver nitrate solution which leads to eroding of aluminium containers.
2. To control the current intensity and potential difference in the electric circuits.
3. Due to the presence of nuclear binding forces that are originated inside the nucleus.

(C) 1. when two pure different individuals bearing two pairs or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independ gently of the others and appears in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).
2. It is a chemical substance (or a chemical message) that controls and organizes most of the vital activities and functions in the bodies of living organisms.
3. It is the breaking up of bonds in molecules of the reactants and formation of new bonds in the molecules of resultants (products) from the reaction.

19 Sohag Governorate

1

(A) 1. ammeter 2. electric resistance.
3. Genes 4. Acquired

(B) 1. c 2. a 3. d 4. b

(C) $E_{battery} = E_1 = 2$ volt

2

(A) 1. The chemical activity series.
2. The speed of chemical reaction.
3. Ohm's law.
4. Radioactivity phenomenon.

(B) 1. b 2. c 3. c 4. b

(C) *Look at the main book on page (135).*

3

(A) 1. (✓) 2. (✗) (electric cell)
3. (✓) 4. (✗) .... insulin ....

(B) 1. The substitution reaction.
2. Reduction process.
3. (a) Yy (b) yy

(C) $NaCl + HCl \xrightarrow{dil.} NaCl + H_2O$

4

(A) 1. natural 2. parallel 3. metal oxide 4. white

(B) 1. ohm 2. Sivert
3. the principle of complete dominance.
4. Hybrid

(C) Because the reactions of covalent compounds take place between molecules.

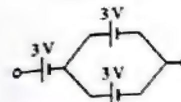
20 Qena Governorate

1

(A) 1. segregation of factors. 2. directly
3. protein. 4. nuclear

(B) 1. (✓) 2. (✗) 3. (✓) 4. (✓)

(C)



2

(A) 1. The chemical reaction. 2. The electric resistance.
3. Catalyst. 4. The ammeter.

(B) 1. Chemical activity. 2. acquired
3. Mendel 4. N_2O_5

(C) Because the low temperature in the fridge slows down the speed of chemical reactions done by bacteria which cause the rot of food.

3

(A) 1. a. the potential difference
b. electromotive force (e.m.f.)
2. a. Adrenal b. adrenalin

(B) 1. Iron 2. Presence of freckles
3. Current produced from electric generators
4. Genes are present in the cytoplasm

(C) – Oxidizing agent : CuO
– reducing agent : H_2

4

(A) 1. d 2. a 3. c 4. b

(B) 1. d 2. b 3. b 4. a

(C) $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

21 Luxor Governorate

1

(A) 1. industrial 2. dominant 3. ohmmeter
4. law of segregation of factors

(B) 1. Formation of sodium chloride and water
$NaOH + HCl \xrightarrow{dil.} NaCl + H_2O$
2. The body stops growing, so the person becomes a dwarf.
3. The catalyst decreases the speed of chemical reaction.
4. It stimulates the storage of glucose in the liver.

(C) • The alternating current results from electron generator.
• The reason :
- it can be transferred for long distances through wires.
- it can be changed into a direct current.

2

(A) 1. c 2. a 3. c 4. b

(B) 1. copper oxide 2. 3 : 1
3. white 4. hybrid

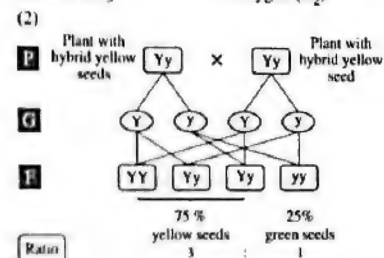
(C) The chemical composition of the hemoglobin changes, so it becomes incapable of carrying oxygen.

3

(A) 1. sievert 2. Endocrine glands
3. The ampere 4. Exophthalmic goiter.

(B) (1) 1. $NaNO_3$ 2. Oxygen (O_2)

(2)

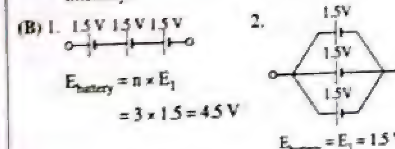


(C) Because the number of gained electrons in reduction process equals the number of lost electrons in oxidation process.

4

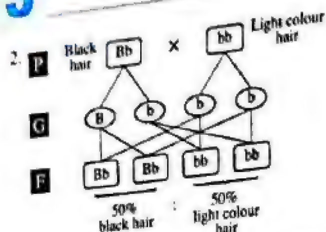
(A) 1. *Look at the main book on page (12).*
2. It is an inflatable bag folded inside the steering wheel in modern cars and they are considered one of the most important safety means in cars at emergencies.
3. Treatment and diagnose diseases like cancer.
4. It is used for measuring the electric current intensity.

(B) 1.



$E_{battery} = n \times E_1$
$= 3 \times 1.5 = 4.5$ V

2. $E_{battery} = E_1 = 1.5$ V

2. 

(C) Because manganese dioxide acts as a catalyst which increases the speed of decomposition of hydrogen peroxide into water and oxygen gas.

22 Aswan Governorate

1

(A) 1. Electric generator 2. HCl
3. dominant 4. faster

(B) 1. d 2. e 3. c 4. a

(C) A black substance of copper oxide is formed and carbon dioxide gas evolves

$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$

2

(A) 1. Law of segregation of factors (Mendel's first law).
2. Reduction process.
3. Radioactivity phenomenon.
4. Chemical reaction.

(B) ① Rr ② r ③ RR ④ rr

(C) Total V = 3 + 4 + 3 = 10 volt

$I = \frac{V}{R} = \frac{10}{2} = 5$ ampere

3

(A) 1. d 2. c 3. b 4. d

(B) 1. Silver 2. Barometer 3. Iron 4. Cancer

(C) 1. Hydrogen gas.
2. Simple substitution reaction.

4

(A) 1. nuclear 2. oxidizing agent
3. directly 4. chemical

(B) 1. Thyroid gland. 2. trachea
3. thyroxin 4. exophthalmic goiter

(C) increases the rate of decomposition of hydrogen peroxide as it acts as a catalyst

23 Red Sea Governorate

1

(A) 1. 2Hg – O_2 2. Thyroid
3. high – low 4. protein
5. reducing – oxidizing

(B) 1. $2N_2O_5$ 2. O_2 3. $4NO_2$

(C) $\because I = \frac{q}{t} = \frac{20}{2} = 10$ ampere

$\therefore V = R \times I = 22 \times 10 = 220$ volt

2

(A) 1. c 2. d 3. b 4. c
5. a 6. b

(B) *Look at the main book on page (100).*

(C) 1. Because magnesium comes before copper in the chemical activity series, so it replaces copper in copper sulphate solution and copper precipitates as red ppt.

$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

2. To obtain a battery, the e.m.f. of it is high.

3

(A) 1. Oxidation process.
2. Hereditary traits.
3. Neutralization reaction.
4. Quantity of charge (q).
5. Chemical activity series.

(B) 1. (a) Direct electric current.
(b) Alternating electric current.
2. The source of the electric current in :
- (a) : Electrochemical cells such as dry cells and batteries.
- (b) : Electric generators such as dynamos.

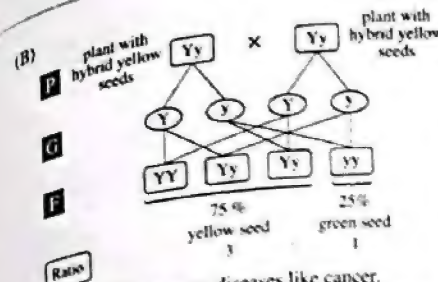
(C) 1. An ignition occurs accompanied by a strong pop sound

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + Heat$

2. The body stops growing, so the person becomes a dwarf.

4

(A) 1. faster 2. metal oxide 3. directly
4. dominant 5. Henri Becquerel.

(B) 

(C) 1. Treat and diagnose diseases like cancer.
2. It stimulates the storage of glucose sugar from the liver.

24 North Sinai Governorate

1

(A) 1. 6 – 8 2. pea plant. 3. dominant trait.

(B) 1. Endocrine glands. 2. Pituitary gland.
3. Chemical reaction. 4. Negative catalyst.

(C) The illumination of the lamp increases, because the resistance decreases, so the current intensity increases.

2

(A) 1. oxidizing factor.
2. The speed of chemical reaction
3. alternating electric current – variable.

(B) 1. (✓) 2. (✗) 3. (✗) 4. (✓)

(C) 1. $R = \frac{V}{I} = \frac{8}{2} = 4$ ohm

2. $\because I = \frac{q}{t}$

$\therefore q = I \times t = 2 \times 60 = 120$ coulomb

3

(A) 1. b 2. c 3. d 4. b

(B) 1. NaCl + H_2O 2. faster
3. hereditary 4. chromosome.

(C) - Oxidizing gent : (Y), because it is the substance which gains an electron or more during a chemical reaction.
- Reducing agent : (X), because it is the substance which loses an electron or more during a chemical reaction.

4

(A) 1. metal oxide 2. 100% 3. chemical 4. work

(B) First :
1. Direct electric current.
2. Electric potential of a conductor.
Second :
(a) Yy (b) YY (c) Yy (d) Yy

(C) 1. $2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

2. $Fe + 2HCl \xrightarrow{dil.} FeCl_2 + H_2\uparrow$

25 South Sinai Governorate

1

(A) 1. Dominant trait. 2. Electrochemical cells
3. Chromosome. 4. Radiation pollution

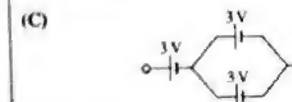
(B) 1. Food becomes rotten due to increasing chemical reaction done by bacteria.
2. The body stops growing, so the person becomes a dwarf.
3. Zinc reacts with dil. HCl immediately and hydrogen gas evolves.
4. This leads to decreasing in secretion of thyroxin hormone and this leads to that the human suffers from simple goiter.

(C) $V = R \times I = 22 \times 10 = 220$ volt

2

(A) 1. (✗) 2. (✗) 3. (✓) 4. (✗)

(B) 1. oxidizing factor (agent). 2. Mendel
3. molecules. 4. gametes

(C) 

3

(A) 1. c 2. b 3. a 4. b

(B) 1. d 2. c 3. b 4. a

(C) oxygen gas

4

(A) 1. Products concentration. 2. $\frac{Joule}{coulomb}$
3. Copper. 4. Barium.

(B) 1. electric resistance 2. yy
3. potential difference 4. 25 %

(C) $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

26 The New Vally Governorate

1

(A) 1. The coulomb.
2. Acquired traits.
3. Reduction process.
4. Pituitary gland.
5. Radioactivity phenomenon

(B) 1. $Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

2. $2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow + Heat$

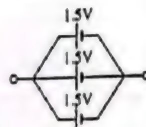
(C) 1. Treat and diagnose diseases like cancer.
2. It stimulates body's organs to respond to emergencies.
3. It is used for measuring the electric resistance.

2

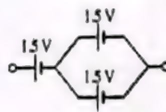
(A) 1. b 2. c 3. d 4. c 5. a

(B) 1. *Look at the main book on page (245).*
2. *Look at the main book on page (134).*

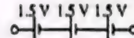
(C) 1. e.m.f = 1.5 volt



2. e.m.f = 3 volt



3. e.m.f = 4.5 volt

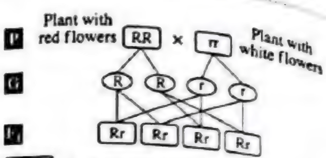


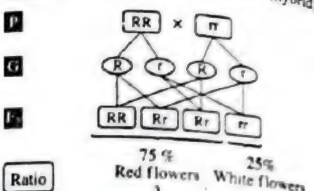
3

(A) 1. $2NaNO_2$ 2. Growth 3. neutralization
4. independent assortment of hereditary.
5. oxidizing

(B) 1. The human will suffer from simple goiter.
2. The rate of decomposition of hydrogen peroxide increases.
3. The electric current will flow from conductor (B) that has the higher electric potential to the other conductor (A)

(C)





4

(A) 1. white 2. oxygen 3. ductless
4. sievert. 5. enzymes

(B) 1. Due to the decomposition of green copper carbonate by heating into copper oxide (black) and carbon dioxide gas evolves

$$CuCO_3 \xrightarrow{\Delta} CuO + CO_2\uparrow$$

2. Because the reactions of ionic compounds take place between ions, while the reactions of covalent compounds take place between molecules.
3. To insure that the plant doesn't be self-pollinated.

(C) t = 60 sec.

$\because I = \frac{V}{R} = \frac{6}{3} = 2$ ampere

$\therefore q = I \times t = 2 \times 60 = 120$ coulomb

27 Matrouh Governorate

1

(A) 1. b 2. b 3. c 4. c 5. d

(B) 1. Due to the presence of a layer of aluminium oxide (Al_2O_3) on aluminium surface, which takes time to separate from aluminium, which delays the starting of occurrence of the reaction.
2. Becauses : - It can be transferred for long distances through wires.
- It can be changed into a direct current.
3. Becauses they release unseen rays spontaneous as a result of their atom's nuclei containing neutrons more than required for their stabilization.

(C) 1. $I = \frac{q}{t} = \frac{30}{60} = 0.5$ ampere

2. $R = \frac{V}{I} = \frac{2}{0.5} = 4$ ohm.

2

(A) 1. Hydrogen. 2. enzyme 3. faster
4. acquired 5. $4NO_2$

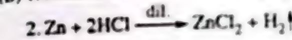
(B) 1. It is used to control the current intensity and potential difference in the electric circuit.
2. - To convert sand to silicon sheets which is used in manufacturing of computer processors and programmed electric circuits that are used in electric appliances.
- To discover defects in manufactured products.
3. It increases the speed of decomposition of hydrogen peroxide

(C) 1. (a) Direct electric current.
(b) Alternating electric current.
2. (a) Electrochemical cells
(b) Electric generators such as dynamoes.

3

(A) 1. Neutralization reaction.
2. The ohm. 3. Chromosome.
4. Chemical activity series. 5. Enzyme.

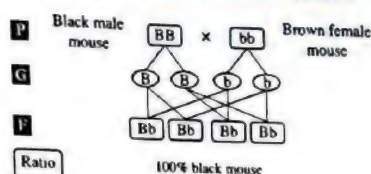
(B) 1. *Look at the main book on page (171).*



2. $Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

$Cu + HCl \xrightarrow{dil.}$ No reaction

(C)



4

(A) 1. copper oxide and water vapour.
2. seven 3. Watson and Crick
4. equal 5. kinetic

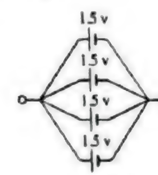
(B) 1. The speed of chemical reaction increases

2. $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$ (white ppt.)

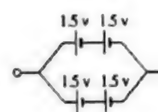
3. A silvery precipitate of mercury is formed and oxygen gas evolves

$$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$$

(C) (1) e.m.f = 1.5 volt



(2) e.m.f = 3 volt



1 Cairo Governorate

1

(A) 1. voltmeter. 2. protein.

3. hydrogen

4. dominant – recessive

(B) 1. It is the arrangement of metals in a descending order according to the degree of their chemical activity.

2. It is the spontaneous decay of the atoms' nuclei of radioactive elements that are present in nature in an attempt to achieve a more stable composition.

3. It is the flow of electric negative charges (electrons) through a conductor.

(C) $I = \frac{q}{t} = \frac{6000}{5 \times 60} = 20$ ampere

2

(A) 1. b 2. c 3. d 4. c 5. d

(B) 1. $E_{(battery)} = n \times E_1$

e.m.f. = 3 × 3 = 9 volt

2. $E_{(battery)} = E_1$

e.m.f. = 3 volt

(C) 1. This may lead to the damage of :

- Bone marrow. • Spleen.
- Digestive system.
- Central nervous system.

2. A yellowish white substance of sodium nitrite is formed and oxygen gas evolves.

$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

3. A white ppt. of silver chloride is formed.

$NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$

3

(A) 1. Speed of chemical reaction.

2. Neutralization reaction.

3. Oxidizing agent. 4. Chemical reaction.

5. Double substitution reactions.

6. The coulomb.

(B) 1. *Look at the main book on page* (131).

2. *Look at the main book on page* (23).

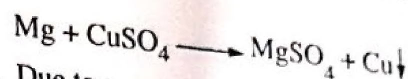
4

(A) 1. segregation of factors. 2. oxygen

3. faster 4. genes.

5. kinetic

(B) 1. Because magnesium comes before copper in C.A.S., so it replaces copper in copper sulphate solution.

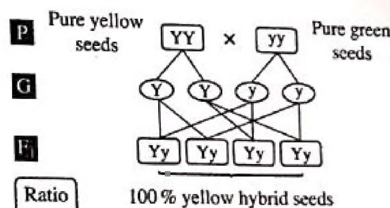


$Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

2. Due to :

- It is easy to be planted and it grows fast.
- Its life cycle is short.
- Its flowers are hermaphrodite, so it can be self-pollinated.
- It can easily be artificially pollinated (human intervention).
- It produces large numbers of plants in a generation.
- It has several pairs of easily recognized contrasting traits.

(C)



Additional questions

(A) 1. a 2. d

(B) Because they secrete their hormones directly in blood without passing through ducts.

2 Giza Governorate

1

(A) 1. 2HCl

2. it has constant intensity and direction.

3. gametes. 4. specific enzyme

(B) 1. *Look at the main book on page* (23).

2. *Look at the main book on page* (168).

(C) This means that the ratio between the potential difference across the two ends of the conductor and the current intensity passing through it is 25 ohm.

2

(A) 1. b   2. b   3. d   4. a

(B) 1. Due to :

- It is easy to be planted and it grows fast.
- Its life cycle is short.
- Its flowers are hermaphrodite, so it can be self-pollinated.
- It can easily be artificially pollinated (human intervention).
- It produces large numbers of plants in a generation.
- It has several pairs of easily recognized contrasting traits.

2. To control the electric current intensity passing through the circuit and the potential difference in the different parts of the circuit.

(C) Work (W) = Potential difference (V) × quantity of electricity (q) = 50 × 20 = 1000 joule.

3

(A) 1. Negative catalyst.

2. Electric current intensity.

3. Pure individual.

4. Chemical activity series.

(B) 1. The speed of chemical reaction increases.

2. The trait of each pair is inherited independently and all individuals of the first generation appear carrying the dominant traits only, and in the second generation, the dominant trait and the recessive trait appear at a ratio of 3 : 1

(C) Figure (c).

4

(A) 1. seven   2. red

3. equal to   4. H_2

(B) 1. They are the traits that are transmitted from one generation to another.

2. They are chemical reactions which involve the breaking up of the compounds by the effect of heat into its primary elements or simpler compounds than the original ones.

(C) By disappearance rate of the blue colour of copper sulphate solution or the appearance rate of the blue colour of copper hydroxide ppt.

Additional questions

1. d   2. d   3. a

3 Alexandria Governorate

1

(A) 1. The Sievert.   2. dominant

3. manganese dioxide – sweet potato.

(B) 1. $Mg + CuSO_4 \longrightarrow MgSO_4 + Cu\downarrow$

2. $2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2\uparrow$

(C) – They decrease the energy needed for the reaction.

– They change the speed of reaction but don't affect either its beginning or stopping.

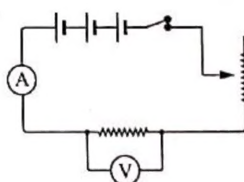
2

(A) 1. Speed of chemical reaction.

2. Electric potential of a conductor.

3. Hereditary (genetic) traits.

(B) 1.



2. e. m. f. = 2 × 3 = 6 volt.

$R = \frac{V}{I} = \frac{6}{6} = 1$ ohm.

(C) It is used to diagnose and treat diseases like cancer.

3

(A) 1. Hydrogen (H_2), because it takes oxygen from copper oxide.

2. Sodium (Na), because it loses one electron.

(B) 1. nucleus   2. electrons

(C) When two pure individuals of any one pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation at a ratio of 3 (dominant trait) : 1 (recessive trait).

4

(A) 1. c 2. b 3. b 4. a

(B) 1. Because the surface area in case of iron filings is larger than that in case of iron piece and the speed of chemical reactions increases by increasing the surface area.

2. Due to :

- It is easy to be planted and it grows fast.
- Its life cycle is short.
- Its flowers are hermaphrodite, so it can be self-pollinated.
- It can easily by artificially pollinated (human intervention).
- It produces large numbers of plants in a generation.
- It has several pairs of easily recognized contrasting traits.

(C) Because the plant of yellow seeds is carrying a hybrid dominant trait.

Additional questions

(A) 1. catalytic converter

2. pituitary gland – master gland – main gland.

(B) 1. (✗) 2. (✓)

4 El-Kalyoubia Governorate

1

(A) 1. The chromosome.

2. The electromotive force.

3. The catalyst. 4. The coulomb.

5. Human genome.

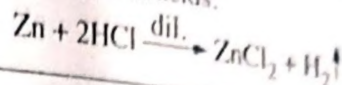
(B) 1. Figure (2).

2. Alternating current – It is produced from dynamo.

(C) 1. Because the gene of the ability to roll the tongue dominates over the gene of the non-ability to roll the tongue if they are both present together in an individual.

2. To control the electric current intensity in the electric circuit and consequently the electric potential difference between its ends.

3. Because copper comes after hydrogen in C. A. S, so it can't replace hydrogen in acids, while zinc comes before hydrogen in C. A. S. so it replaces hydrogen in acids.



$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

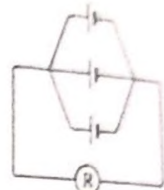
2

(A) 1. b 2. c 3. b 4. a 5. a

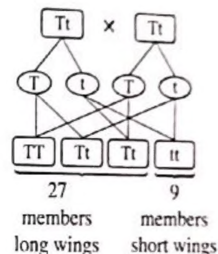
(B) $R = \frac{V}{I}$

$V = R \times I = 4 \times 1.5$

$= 6$ volt



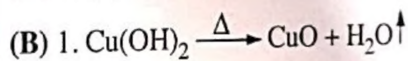
(C)



3

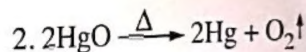
(A) 1. (✗) 2. (✓) 3. (✓) 4. (✗) 5. (✓)

(B) 1.



$Cu(OH)_2 \xrightarrow{\Delta} CuO + H_2O\uparrow$

2.



$2HgO \xrightarrow{\Delta} 2Hg + O_2\uparrow$

(C) 1. $I = \frac{q}{t} = \frac{100}{20} = 5$ ampere

2. $V = \frac{W}{q}$

$V = \frac{1000}{100} = 10$ volt

$R = \frac{V}{I} = \frac{10}{5} = 2$ ohm

4

(A) 1. The dominant trait appears.

2. Increasing the number of collisions by increasing the temperature.

3. The rate of decomposition of hydrogen peroxide increases.

4. The current intensity in the conductor increases.

(B) 1. When the number of neutrons is more than the number required for its stability.

2. *Look at the main book on pages* (163, 164 and 165).

(C) 1. (A) : $NaCl$ (B) : $NaNO_3$

2. Gas (D) : Oxygen gas, by approaching a burning match, the glowing of match increases.

3. AgCl – White ppt.

Additional questions

(A) 1. (✗) 2. (✗)

(B) 1. Catalytic converter. 2. Air bags.

5 El-Menofia Governorate

1

(A) 1. Chemical activity series. 2. Oxidation.

3. Electric potential of a conductor.

4. Electric resistance.

5. The chromosome. 6. Pea plant.

(B) 1. $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl\downarrow$ (white ppt.)

2. $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2\uparrow$

(C) 1. The chemical reaction which results in a protein showing a specific hereditary trait will not occur.

2. This may lead to the damage of :

- Bone marrow.
- Spleen.
- Digestive system.
- Central nervous system.

2

(A) 1. Ohmmeter – Peaceful uses of nuclear energy.

2. Pressure – Ohm's law.

3. Produce direct current – Electric generators.

4. Attached ear lobe – Dominant traits in human.

(B) 1. *Look at the main book on pages* (10 & 11).

2. *Look at the main book on page* (182).

3. • **Ordinary rice :** It doesn't contain pro-vitamin (A).

• **Genetically Modified rice :** It contains pro-vitamin (A).

(C) 1. $V = 2 + 3 + 3 = 8$ volt.

$I = \frac{V}{R} = \frac{8}{2} = 4$ ampere.

2. $q = I \times t = 4 \times (2 \times 60) = 480$ coulomb

$W = V \times q = 8 \times 480 = 3840$ joule

3

(A) 1. d 2. b 3. a 4. a 5. c

(B) 1. It is used to control the current intensity and potential difference in the electric circuit.

2. It is used to reduce the electric potential.

3. ***Look at the main book on page (205).***

(C) 1. Simple substitution reaction

[A metal substitutes the hydrogen of acid]

2. The effect of surface area on the speed of a chemical reaction.

3.
$Zn + 2HCl \xrightarrow{dil.} ZnCl_2 + H_2\uparrow$

4

(A) 1. $4NO_2$

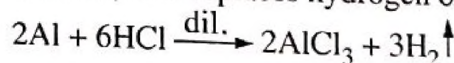
2. Sulphur trioxide (SO_3)

3. Genes. 4. Iron rust

(B) 1. It is the breaking up of bonds in molecules of the reactants and formation of new bonds in the molecules of resultants (products) from the reaction.

2. It is the spontaneous decay of the atoms' nuclei of some radioactive elements that are present in nature in an attempt to achieve a more stable composition.

(C) 1. Because aluminium comes before hydrogen in C.A.S. , so it replaces hydrogen of diluted acids.


$2Al + 6HCl \xrightarrow{dil.} 2AlCl_3 + 3H_2\uparrow$

2. Because the low temperature in the fridge slows down the speed of chemical reactions done by bacteria which cause the rot of food.

3. Because the trait of green pods dominates over the trait of yellow pods in the pea plant according to the principle of complete dominance.

Additional questions

1. c 2. d 3. a